Rio Hondo

Library and Learning Resource Center

Jennifer Mers

Lighting/Electrical Option
5th Year Senior Thesis
Advisor: Dr. Moeck

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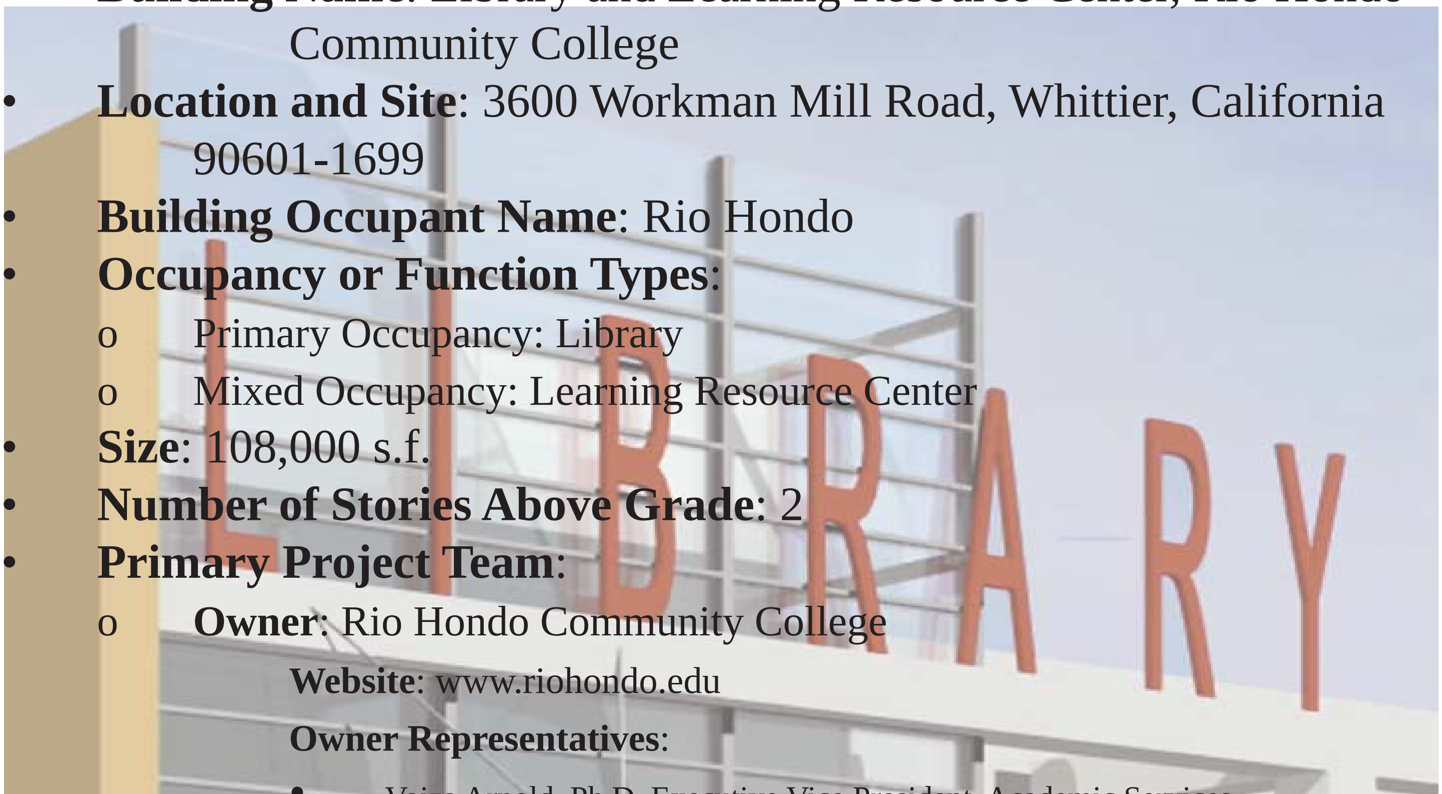
Executive Summa

Background



- **Building Name**: Library and Learning Resource Center, Rio Hondo Community College
- **Location and Site**: 3600 Workman Mill Road, Whittier, California 90601-1699
- **Building Occupant Name**: Rio Hondo
- **Occupancy or Function Types**:
  - Primary Occupancy: Library
  - Mixed Occupancy: Learning Resource Center
- **Size**: 108,000 s.f.
- **Number of Stories Above Grade**: 2
- **Primary Project Team**:
  - **Owner**: Rio Hondo Community College
    - **Website**: www.riohondo.edu
    - **Owner Representatives**:
      - Voiza Arnold, Ph.D, Executive Vice President, Academic Services
      - Dr. Andy Howard, Executive Director, Planning and Developing Office L-400C
  - **Architect**: AC Martin Partners, Inc
    - Website: www.acmartin.com
  - **MEP Engineers**: GLUMAC International
    - Website: www.glumac.com
  - **General Contractor**: AC Martin Partners, Inc
    - Website: www.acmartin.com
  - **Electrical Contractor**: GLUMAC International
    - Website: www.glumac.com
  - **Structural Engineers**: AC Martin Partners, Inc
    - Website: www.acmartin.com
  - **Landscape Architect**: WRT
    - Website: www.wrtdesign.com
- **Dates of Construction**:
  - **Planned**: 2008
- **Cost**: 27.3 million


L I B R A R

Architecture

The Library and Learning Resource Center that Rio Hondo Community College is adding will be a beacon sitting atop a hill for the city of Whittier. With its glass façade at night it will be perceived as a glowing lantern for the community. It provides a place to study and learn for the students. It is located on the lower quad of the campus and is designed to emphasize the surrounding landscape.

The project consists of two floors above grade with the stacks being located on the second floor. The first floor contains study rooms, lecture halls, offices, and studios. The second floor consists of more open spaces with the stacks and a large reading/study area. The architect plays with overlapping, multi-level ceiling planes in the large reading area to make the space more interesting than just a box. Along with the large public tables in the middle of the area the architect also creates intimate spaces along the perimeter walls of the reading area.

Building Envelope:

The exterior walls are made of precast concrete. Throughout the building there are concrete columns and concrete slab. A glass curtain wall wraps the south façade structure. The glass is Solarban 60 clear vision glass and Solarban 60 clear vision glass with ceramic frit.

The second floor consists of concrete columns, steel beams, and composite decking. The main entrance has an 18” thick concrete shear wall and aluminum glass curtain walls on the other two sides. While walking through the main entrance you walk under an aluminum canopy that extends into the interior of the building. On the north façade lies a steel frame wire glass window.

The larger portion of the roof of the Library/ Learning Resource Center is sloped downward from the center of the building towards the outside. The ceiling height ranges from 15’-20’. The roof is made of single ply membrane.

Mechanical:

The mechanical system of the variable air volume system of the Library/Learning Resource Center contains:

Five fan coil units located in the Dean’s Office, Library Meeting Room, Extended Hours Study, and two Teleconference Lounges. The fan coil in the Dean’s Office is rated at 275 cfm. The fan coil in the Library/Meeting Room is rated at 700 cfm. The fan coil in the Extended Hours Study is rated at 1600 cfm. And both fan coils in the Teleconference Rooms are rated at 1200 cfm.

Two air handling units located on the roof service each floor separately. The first floor air handling unit is rated at 45,000cfm and the second floor air handling unit is rated at 52,000 cfm.

One plate and frame heat exchanger

Four sound traps that are sized from 42000-52000 cfm.

Four exhaust fans that are located on the roof and service toilet exhaust, electrical room, and the elevator machine room.

One hot water pump that is located on the ground floor

Lighting:

Lighting in the Library/Learning Resource Center consists primarily of fluorescent lamps running from 277/120V. Metal halide lamps are used for a few areas such as the entry exterior glass wall, exterior signage, columns, and in special areas of the lobby.

Due to the large focal point in the lobby that extends to the top of the ceiling at 38’ high, metal halide floor recessed luminaries are used to achieve the best uniformity on the three panels. The lobby also consists of an exhibit area that uses (2) 20w T4 CMH, in a combo light can allow for accenting the exhibits. Because the lobby is a two story atrium, metal halide lamps are used at the entry to achieve the correct light level. The fluorescent lamps did not have the output to put the correct light level in the space because of the high ceiling. The lobby also contains recessed adjustable wallwash troffers that provide light for the walls under the open walkway. In the lobby the bridge contains recessed downlights to provide adequate lighting under the bridge.

The stack area had to be lit from stack mounted fluorescents due to the architects desire to keep the ceiling clean from a ton of fixtures.

Electrical:

All power distribution in the Rio Hondo Library and Learning Resource Center is the standard 120/208V and 277/408V. Power is first brought into the system through a 1000KVA campus utility transformer that feeds into the main switchboard. The main switchboard is rated at 1200 A, 277/4808V, 3P, 4W and GND, 42KAIC. This switchboard services Panel 1L and Panel 2L along with the mechanical equipment and both elevators. A central inverter is also powered from the main switchboard. Power is then fed through two transformers rated at 150KVA and 225KVA, respectively.

These two transformers then feed into two distribution boards that are sized at 600A, 120/208V, 3P, 4W and GND, 42KAIC and 800A, 120/208V, 3P, 4W and GND, 42KAIC, respectively. These distribution panels provide power for panels 1A, 1B, 2A, 2B, 1C, the roll up gate, 1D, 1E, 2C, 2D, 1F, 2E, and finally 1G. This can be seen from the single line diagram in the appendix. All panels are sized at 150A, except for 1G which is sized at 100A. These panels are located in different rooms which can be seen from the attached electrical drawing in the appendix.

Due to the LEED credit, daylight sensors are needed around the glass curtain wall on the south façade of the building. During the day surface mounted fixtures around the glass wall should be turned off to save energy when not necessary.

The classrooms, offices, and private offices all consist of pendant mounted indirect/direct linear acrylic patterned diffuser luminaires. Back of house rooms contain just simple strip lights with wire guards for functionality.

Lighting Depth

Depth Analysis: Lighting Design

Lighting design is not just the placement of lights, but the concept and feeling it portrays as well. ASHRAE 90.1 and LEED both have to be observed, while creating different atmospheres for different spaces. Rio Hondo Library and Learning Resource Center aims to be a beacon for the campus and shall be emphasized with the light.

In becoming a beacon, a lantern for the community, the library needs to feel warm and inviting, so people feel welcome and want to be in that space. Four spaces were chosen to accomplish these atmospheres: Lobby, Microfilm and Reading Area, Stacks, and Exterior Façade. The redesign of the exterior will highlight the architectural features while providing the lantern effect for the community. The three other spaces will achieve a clean, warm environment that will invite students to learn in a comfortable atmosphere.

After satisfying ASHRAE 90.1 the next goal will be the highest LEED credit possible for the building. The goal of the lighting design will be to achieve the correct light levels while minimizing the power consumption and maximizing the natural daylight.

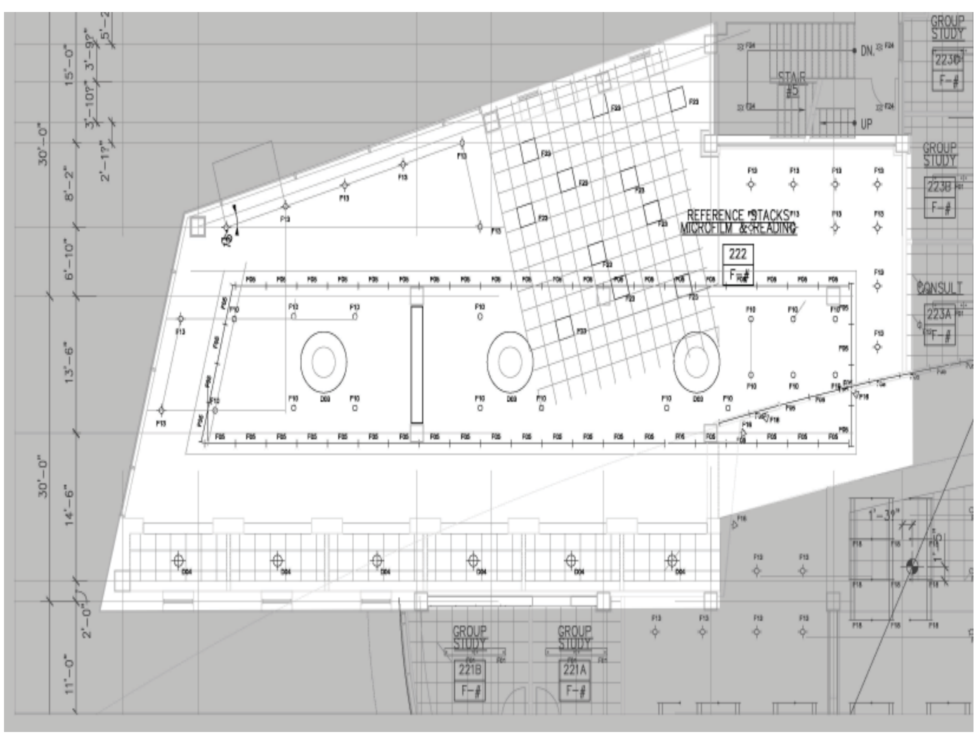
The following report shows a lighting daylight research into three possible solutions for new daylighting systems for two of the spaces. Each were calculated with the use of AGI 32 lighting software to see which system directed the most daylight into the area.

In addition to the daylighting system, new lighting designs were implemented in the four spaces to achieve certain atmospheres in the different spaces. The spaces are all unique and had different criteria that needed to be met. This is explained further in detail when describing each space.

Microfilm and Reading Area

Reference Stacks and Microfilm Area – In this unique area the architect plays with multi level ceiling planes that adds interest to the space. Under the center ceiling plane that runs west to east through the space lays the open space where group tables are located. Then close to the perimeter of the space on the south side the architect creates much smaller more intimate spaces.

In this reference area, the lighting takes more of a playful theme with the huge 6’ globular fixtures made by DARK from Belgium. Inside the intimate spaces pendants hang making the space a much more relaxed environment. Downlights are recessed in the ceiling plane to achieve at least 30 fc on the work plane below. Above the ceiling plane, there are cove lights which illuminate the ceiling and further define the ceiling plane with a band of light.



DESIGN CRITERIA

- Appearance of Space and Luminaires

In this space the architect chose the luminaires which shows how important the appearance of the space and luminaires is to this area. In this area the lighting takes on a different shape. In this space the architect wished to use globular luminaires instead of the square or rectangle shape used in the majority of the building. These luminaires add interest to the space and make it not feel as though you are in a library. Keeping this feeling will be a big goal in this revision.

- Color Appearance and Color Contrast

The appearance of faces in this space is highly important because it is where group studies can take place. Being able to see your partner without harsh shadows is a must. Color appearance is crucial because you want to be comfortable in this space and bad color rendering is not inviting.

- Daylighting Integration

Daylighting is another issue in this space but not as critical as in the others that are being evaluated. In the small intimate areas daylighting can be addressed because one of the walls in the small space are the Solarban 60 window which will allow natural daylight to be utilized. How much needs to be further looked into.

- Direct Glare

A glare calculation needs to be done with the huge globular fixtures that DARK makes. Studying directly under the luminaires will prove to be hazardous with glare. Being able to read and write in this space is crucial so too much glare will be totally unacceptable. Also this is the Microfilm area which means VDT use is high, so any glare should be addressed.

- Luminances of Room Surfaces

In this unique area, the luminances of the room surfaces should be highly important. The architect went to all the trouble in making these intersecting different level ceiling planes why not accentuate that with the lighting. There is also small stacks that are located on the vertical surfaces in between the small, intimate study areas. Bringing out different levels of luminances will give the space an even more unique feel, while following the architecture.

- Uniform Light Distribution on Task Plane

This is very important considering the tasks at hand. A low ratio of max/min will be needed on the task plane. Avoiding hot spots and drop offs will be necessary.

- Reflected glare

Reflected glare is as important as direct glare because of the VDT use in the area.

- Illuminance (Horizontal)

Horizontal illuminance for reading is 30 fc or greater.

- Illuminance (Vertical)

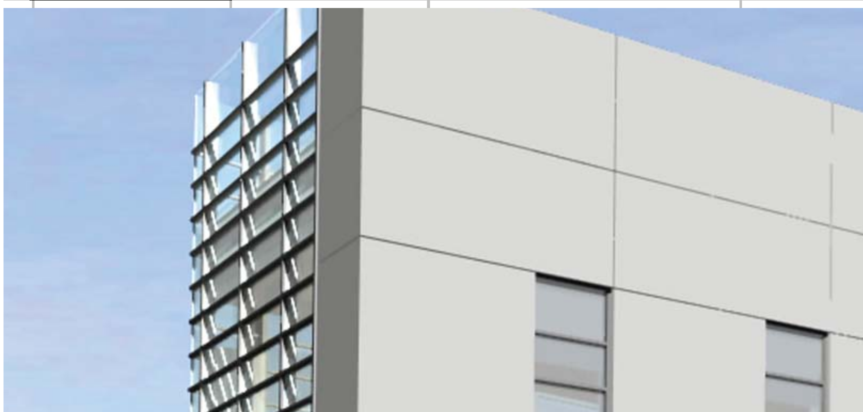
Vertical illuminance is not of high importance in this space other than to accentuate the space and for facial rendering.

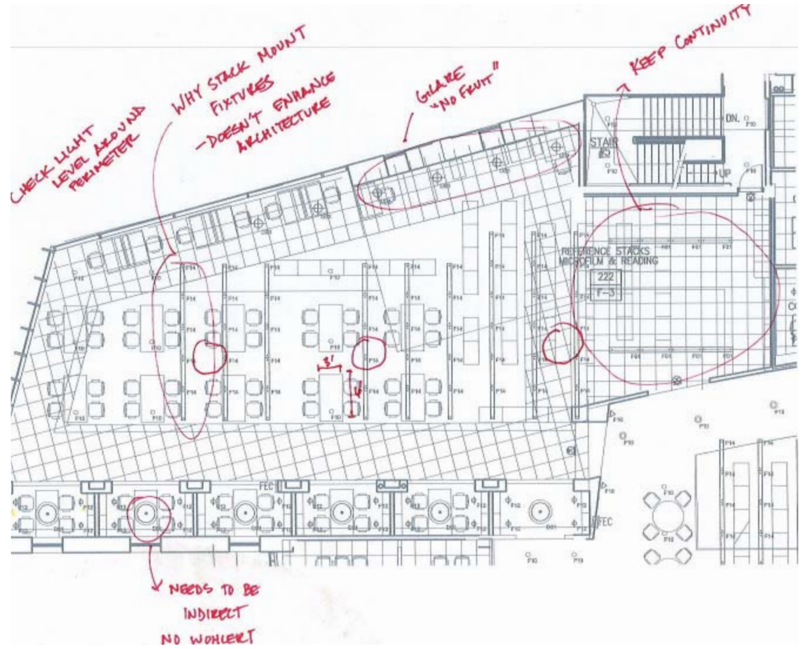
- Title 24

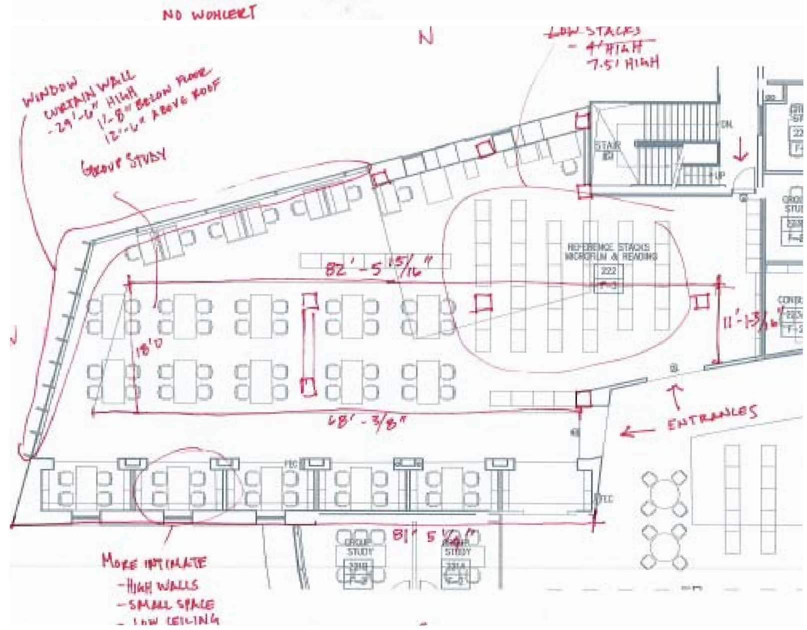
In this area according to ASHRAE 90.1, the allowed wattage for this space based on area is 4491 watts per ft^2. Currently summing the ballast watts for this space, only 3095 watts have been used which falls greatly below the maximum power allowance.

Materials and Reflectances

Location	Ceiling	Ceiling	Ceiling	Walls	Floor
Materials	Higher ceiling plane	Lower ceiling plane Painted Gypsum	Painted Gypsum Board	Painted Gypsum Board	Carpet
Reflectance	0.55	0.57	0.23	0.91	0.3



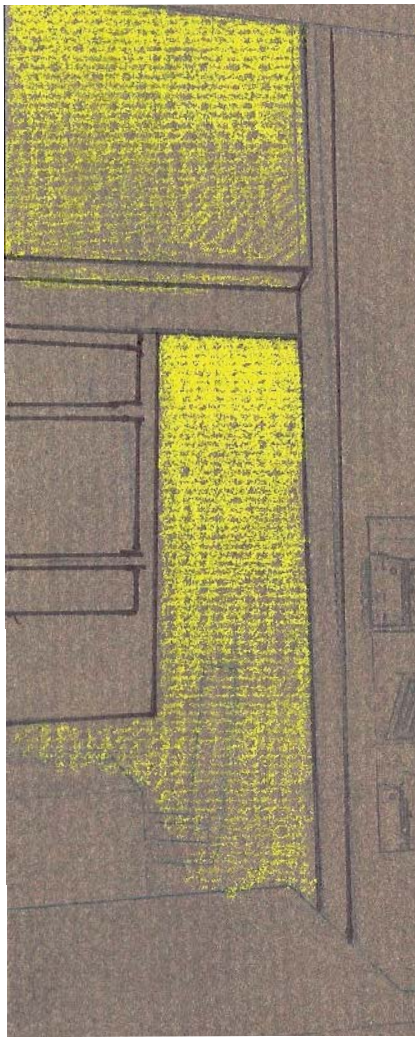



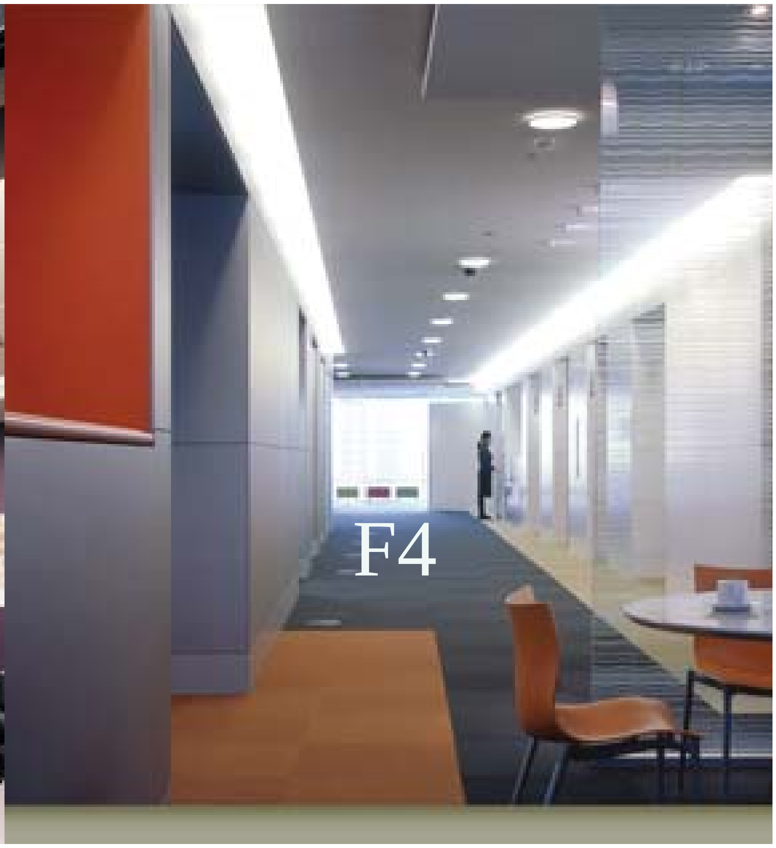


Design Process

Schematics

The design process starts with recognizing the problems with the given system. The first problem in this area, the architect chose the aesthetics of the fixture as opposed to the function of the fixture. In redesigning this area, function came first. Layers of light enhance the architecture within the unique space: lighting the ceiling with a cove light, the walls with linear wall washers, downlights to achieve the correct light level, and indirect pendants to throw another layer of light onto the ceiling. The use of clean indirect and direct fixtures adds the fourth element to the architecture.





Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
F04	Fluorescent	Recessed 1x4 Wallwash Troffer	"Avenue A" series	28w	(1) 28w T5	82	3500
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F10	Fluorescent	Recessed 6" Downlight	5-11/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	32w	(1) TT	82	3500
F12	Fluorescent	Recessed 6" WallWash	"Haze" Alzak reflector	32w	(1) TT	82	3500
F18	Fluorescent	Indirect Pendant	"Metro" series, low profile round housing 11" diameter luminous acrylic diffuser	42w	(4) TT	82	3500
F23	Fluorescent	Recessed 2'x2' Square	"Sky" series, Bi directional	14w	(4) 14w T5	82	3500


Ballast Schedule

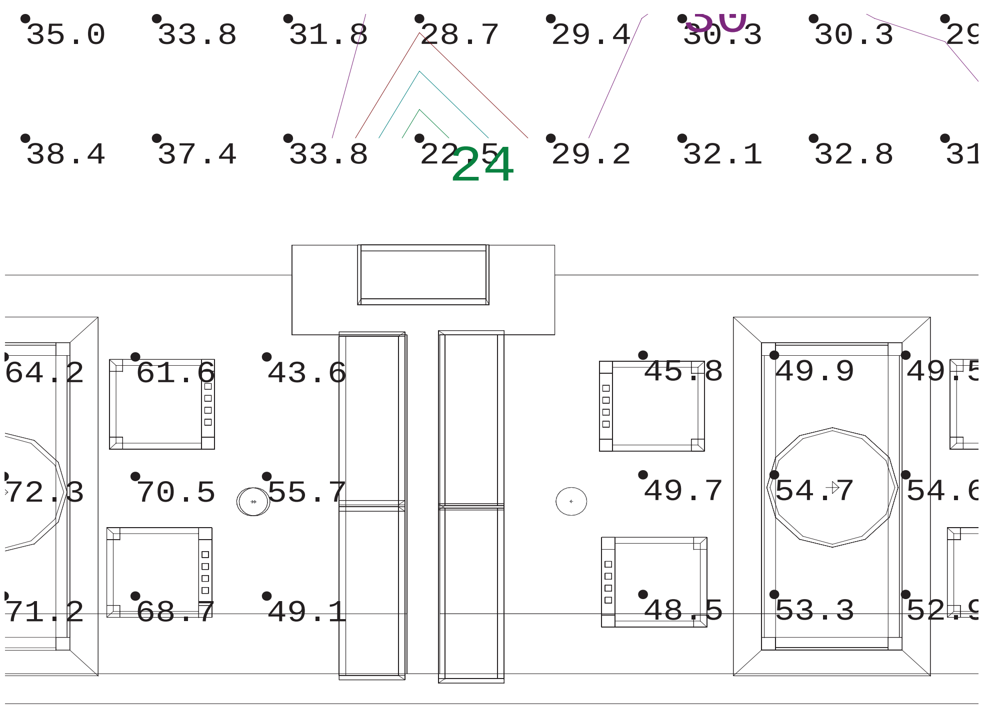
Ballast ID	Ballast	Voltage	Lamp	Input Wattage	Input Current	Fixtures	Electric/Magnetic	Dim
Es5840K	Ballast 1	120	(1) T5	63	0.53	F05	Electronic	Yes
ES5000	Ballast 2	120	(1) 32w TT	35	0.3	F10, F12	Electronic	Yes
Es5850	Ballast 3	120	(4) 14w T5	56	0.28	F23	Electronic	Yes
Es5000HT	Ballast 4	120	(4) 42w TT	176	0.34	F18	Electronic	Yes
ES5842K	Ballast 5	120	(1) 28w T5	37	0.3	F04	Electronic	Yes

Power Density

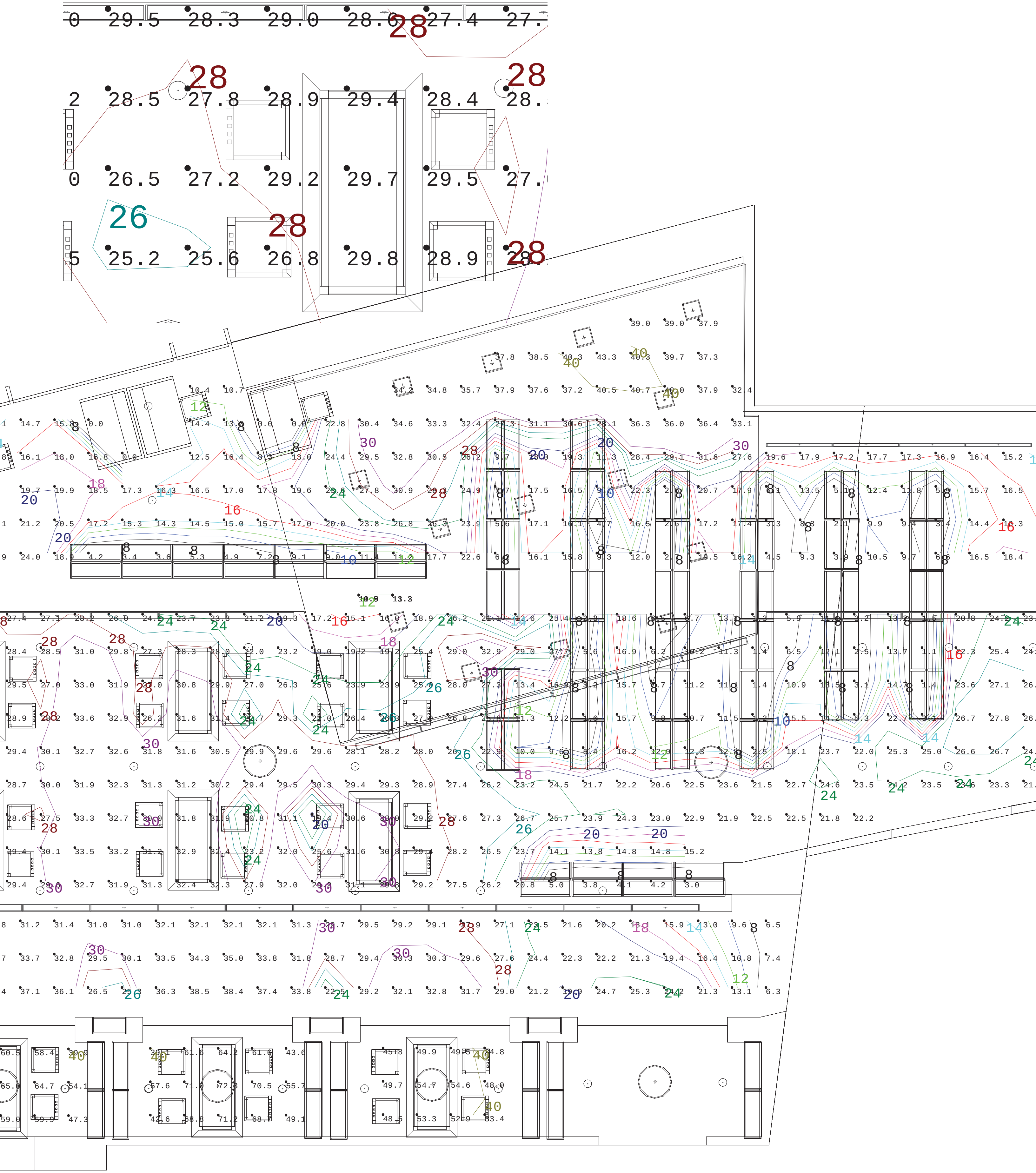
Location	Fixture	Quantity	Watts	Total Watts	Area (ft^2)	Power Density	Allowable Power Densi
Microfilm Area	F05	30	63	1890		1.492465534	1.5
	F10	26	35	910			
	F12	12	35	420			
	F18	9	176	1584			
	F23	10	56	560			
	F04	6	37	222	3742.8		

Light Loss Factors

Type	Maintenance Category	Cleaning Interval	LLD	LDD	RSDD	BF	Total LLF
F04	V	Clean - 12 months	0.95	0.88	0.96	1	0.80
F05	VI	Clean - 12 months	0.94	0.92	0.66	1	0.57
F10	IV	Clean - 12 months	0.84	0.95	0.91	1	0.73
F12	IV	Clean - 12 months	0.84	0.95	0.93	1	0.74
F18	IV	Clean - 12 months	0.85	0.88	0.96	1	0.72
F23	V	Clean - 12 months	0.95	0.92	0.93	1	0.81



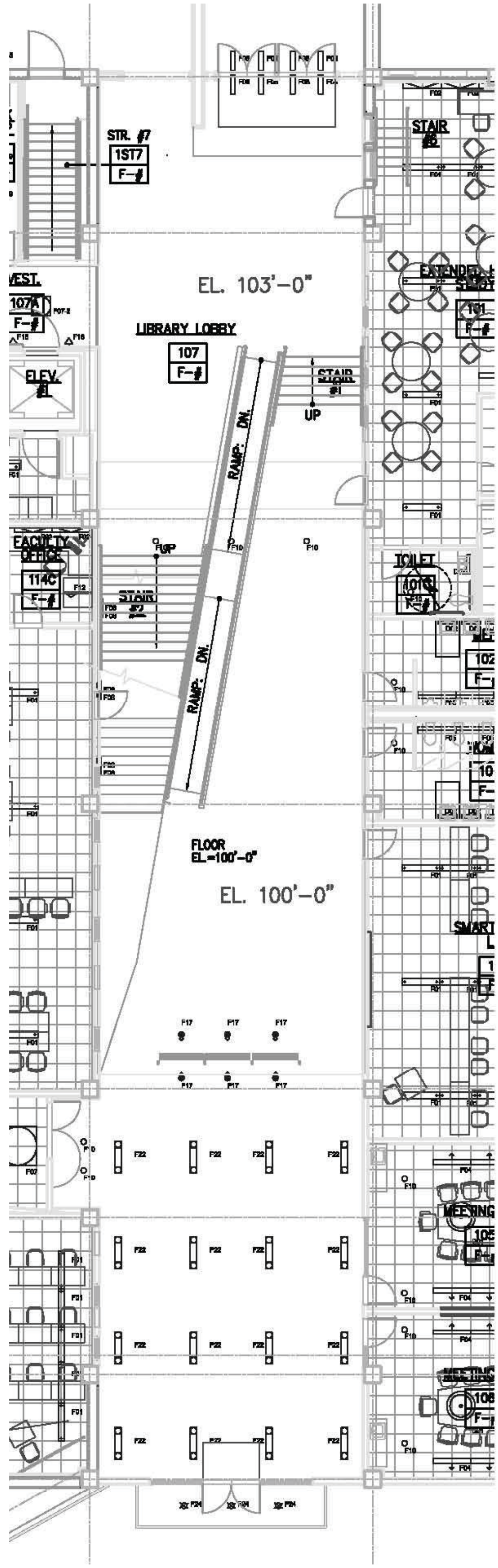
5Fc
10 Fc
15Fc
20 Fc
25 Fc
30 Fc
40 Fc
50Fc
60Fc



Conclusions

In this area the use of simple unobtrusive fixtures allow the space to show off its architecture. The light now serves a function. The use of indirect and direct fixtures enhances the space with multilayers of light.

Lobby


STR. #7
1ST7
F-#
STAIR
#8
EL. 103'-0"
LIBRARY LOBBY
107
F-#
STAIR
#1
UP
RAMP: DN.
ELEV.
#1
FACULTY
OFFICE
114C
F-#
TOILET
STAIR
#2
RAMP: DN.
FLOOR
EL.=100'-0"
EL. 100'-0"

A Circulation Space

The Lobby – The lobby is a two story open circulation space. It contains a 3 panel focal point that extends to the top of the 39' ceiling and separates the lobby into two different spaces: the large circulation space, and the gallery space. A skylight runs lengthwise along the left side of the lobby. Daylight will be able to be addressed. Access to the second floor is available by ramp or by stairwell. Above the stairwell there is a floating wooden ceiling. A bridge runs across widthwise connecting the west and east side on the second floor. Activities include a gallery space, circulation, and access to the second floor.

The existing lighting in this area is primarily fluorescent however in some areas metal halide was used due to the high ceilings. Recessed elliptipar fixtures are used in the slanted ceiling plane to illuminate the walls to relieve the cave effect. Downlights are used in the floating wooden ceiling above the stairwell as well as under the bridge to achieve the needed 10 fc for circulation in a lobby space. Recessed floor uplights are used to accent the three panels that are the focal point in the lobby. Recessed wall lights are used under the stairwell and in the entrance of the lobby to achieve the needed 10 fc. In the space in the rear of the lobby there are recessed multi-lamp fixtures with mixed metal halide and fluorescent sources. The primary activity in this space is a gallery space for art work to be displayed. In technical assignment three I will investigate if there is a better way for this area to be illuminated.

Design Criteria

• Color Appearance and Color Contrast

The color appearance in a lobby should be very important because it is the first space that people encounter. As much as it should be inviting, it should not cast unwanted shadows on people's faces. Good face rendering and skin coloring should be a goal of the lighting of the lobby too. CRI should be kept at mid 80's or higher because good color rendering is important when you first enter a space. This CRI should aid in face rendering and skin coloring. The CCT should stay in the 3000 range making the space inviting and comfortable.

• Reflected Glare

Reflected glare could be an issue in this space due to the reflective materials. Much of the lobby is made of wood and glass where reflected glare will be a problem. Avoiding this glare into the eyes of the public will need to be addressed. Could be checking the angles of the direct light or maybe changing to a less reflective material.

• Illuminance (Vertical)

A value from 5-10 fc should be reached for people's faces in the lobby. The three panel focal points should reach a level where it is a high contrast to the surrounding that draws immediate attention.

•Appearance of Space and Luminaires

The lobby is a two story atrium that has clean straight lines throughout the space. Many of the luminaires are hidden in respect that they are recessed in the ceiling. The luminaires that are visible to everyone need to be clean, straight fixtures that reinforce the architecture of the building. Under the bridge, and under the floating wooden c eiling lie recessed downlights giving the walkway the correct light level. Located in the ceiling close to the skylight are recessed adjustable wallwash troffers that throw light onto wall that extends up to the second floor. The floor uplights accent the three panels that are the focal point in the lobby. The lobby is the first place where visitors and students enter and should leave an impression yet be functional. The lighting is equally important because it introduces the visitors to the space and serves the function of circulation.

• Direct Glare

Direct glare is a very important element to not have inside a lobby space. A calculation will need to be done to make sure the glare rating is acceptable in the space. The space seems to be big and tall enough to not have luminous surfaces that are considered too bright.

• Luminances of Room Surfaces

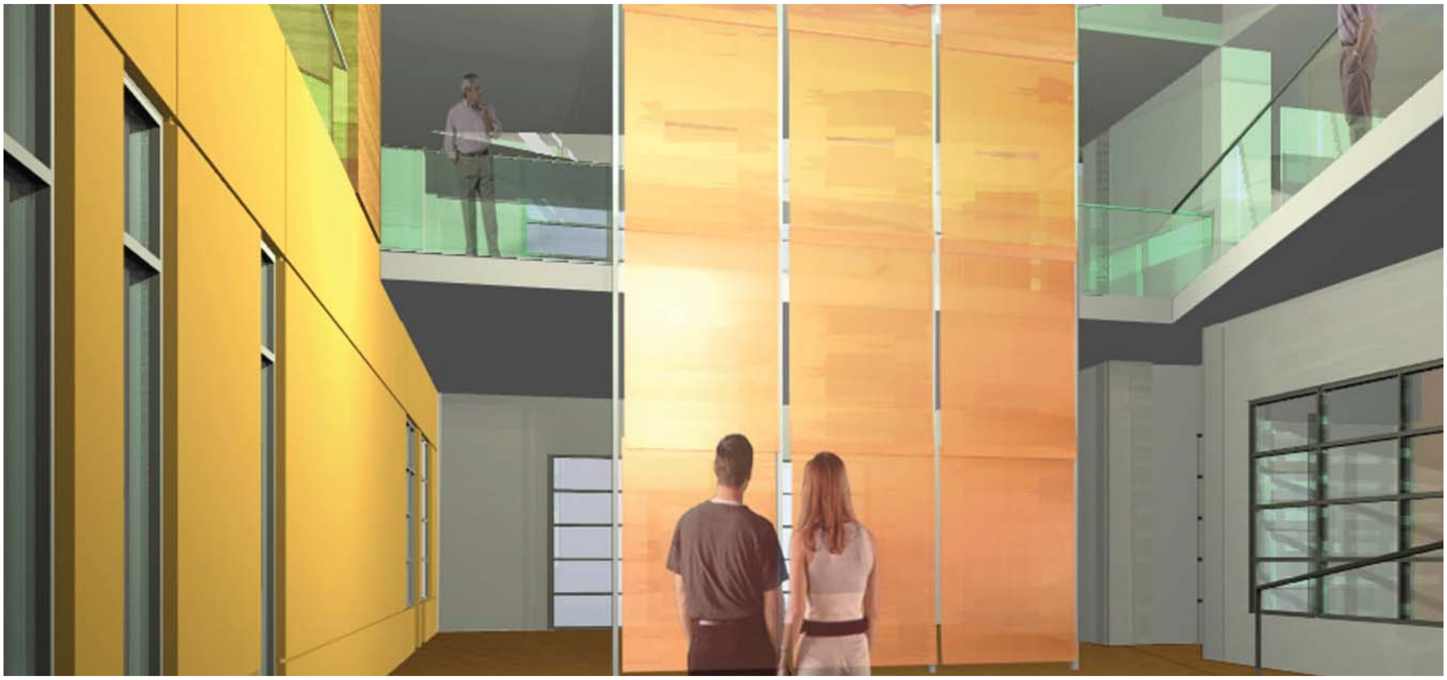
The luminance values of a room are always important in a space that is primarily meant for circulation. Lighting the spaces to different luminances should guide a person through the space. My concern right now is the area in the back of the lobby where the gallery space is located. Further investigation will show if the space is overlit and draws too much attention with a high ratio contrast compared to the other parts of the lobby.

• Illuminance (Horizontal)

According to the IESNA Handbook the horizontal illuminance is 10 fc for the general entrance in the lobby space. If the lobby achieves 10 fc on the ground plane then the visitors have ample light to find their way around. With the entrance being primarily made of glass, the natural daylight should illuminate the entrance space to at least 10 fc. Dimmers may be able to be used in this situation. The transition from the extremely bright natural daylight to unnatural illuminance

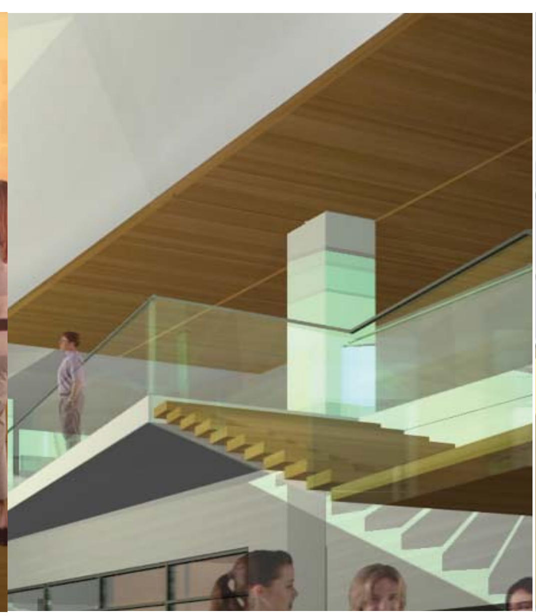
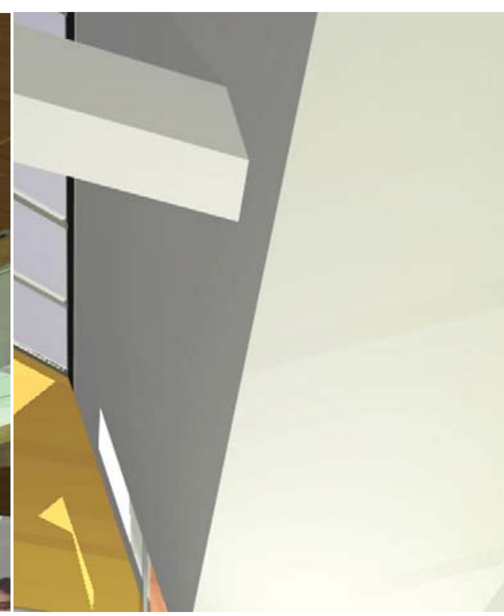
• Title 24

According to ASHRAE 90.1 space by space method the allowed watts for this lobby space is 6268.5 watts per ft^2, that is 1.5 watts per ft^2 and the area of the space is 4179 ft^2. Currently by summing the ballast watts for the fixtures in this space the total wattage is 3124 watts per ft^2. Currently the power density is well below the



Materials and Reflectances

Location	Ceiling	Floating Ceiling	East Wall	Entry Wall	All other walls	Floor	Glass
Materials	Painted Gypsum Board	Wood	Wood Veneer Paneling	Painted Concrete	Painted Gypsum Board	Carpet	Clear Glazing
Reflectance	0.91	0.77	0.6	0.73	0.91	0.3	.8 transmittance

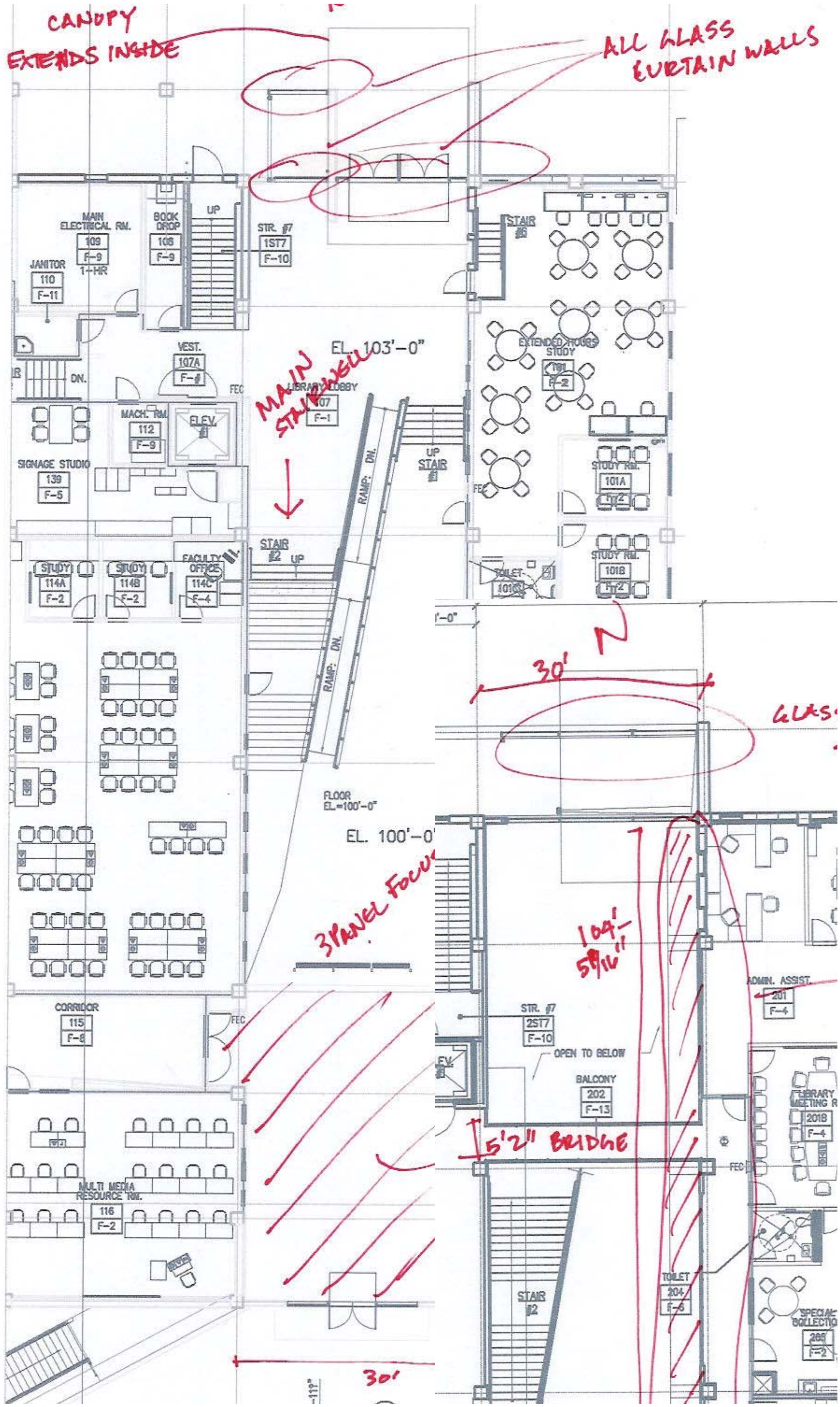




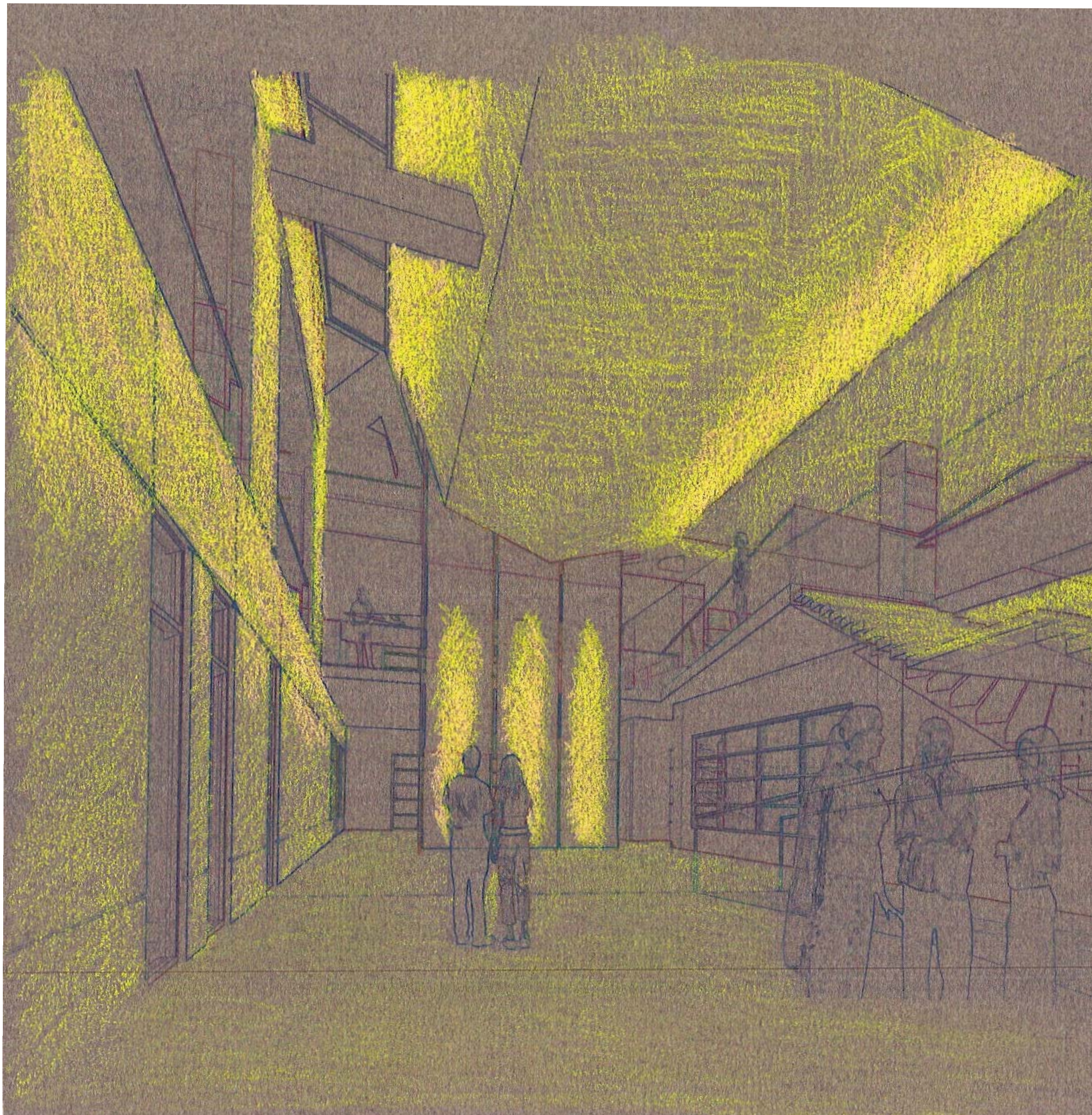
Design Process

As this space was approached there were different factors than the Microfilm Area. The lobby space is the first space students and visitors enter when they use Rio Hondo's Library and Learning Resource Center. The need for comfort and an inviting atmosphere takes precedence in this space. This two story atrium has a huge 39' focal point that takes hierarchy in the middle of the lobby. Behind the panels the space is designated for an ever changing gallery space for artwork to be displayed. Nothing is permanent in this space, so the lighting had to be the most flexible possible in being able to shoot and highlight at different angles from one day to the next. This is also more of an intimate space being that it is only 10' high compared to the 39' ceiling beyond the panel. The lobby has to have two atmospheres to address each different environment.

FUNCTION:
CIRCULATION
FIRST IMPRESSION
2 STORY ATRIUM

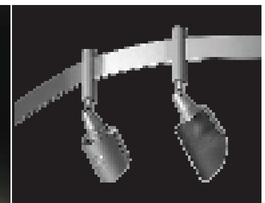
W





The goal of main lobby area is to glow as a beacon for the campus. The front and rear façade are predominately glass calling for it to be a lantern. For this effect, all the surfaces must be illuminated so there are no dark spots on the inside. So from the outside it reads as a glowing force. The main features are the angled ceiling, the huge focal points, and the warm materials. The three main panels are lit from in-grade fixtures allowing the panels to be highlighted. The walls are lit from linear wall washers giving off a uniform wash. The ceiling is lit from the walls above the second floor. Angled luminaries push the light towards the ceiling. Beams that cross into the angled ceiling from the second floor were used to house downlights that also have the capability of being angled so the walls and the floor can be washed. Washing the walls with warm light will enhance the warm materials chosen for this space.

Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F08	Fluorescent	Recessed Step Light	"Heli" series,	20w	(1) T9	85	3500
F10	Fluorescent	Recessed 6" Downlight	5-11/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	42w	(1) TT	82	3500
F17	Halogen	Recessed Adjustable Light	"Grid in Limit" series, includes Reflector FL-20 degrees and Glass UV Q Top	50w	(2) 50w	82	3000
F21	Halogen	Juno Track Light	"Classic" series	50w	(1) 50w MR16	100	3050
F22	Halogen	Recessed Floor luminaire	Erco "Nadir" series, 30 degree angle	75w	(1) PAR 30	81	2830
F04	Fluorescent	Recessed 1x4 Wallwash Troffer	"Avenue A" series	28w	(1) 28w T5	82	3500



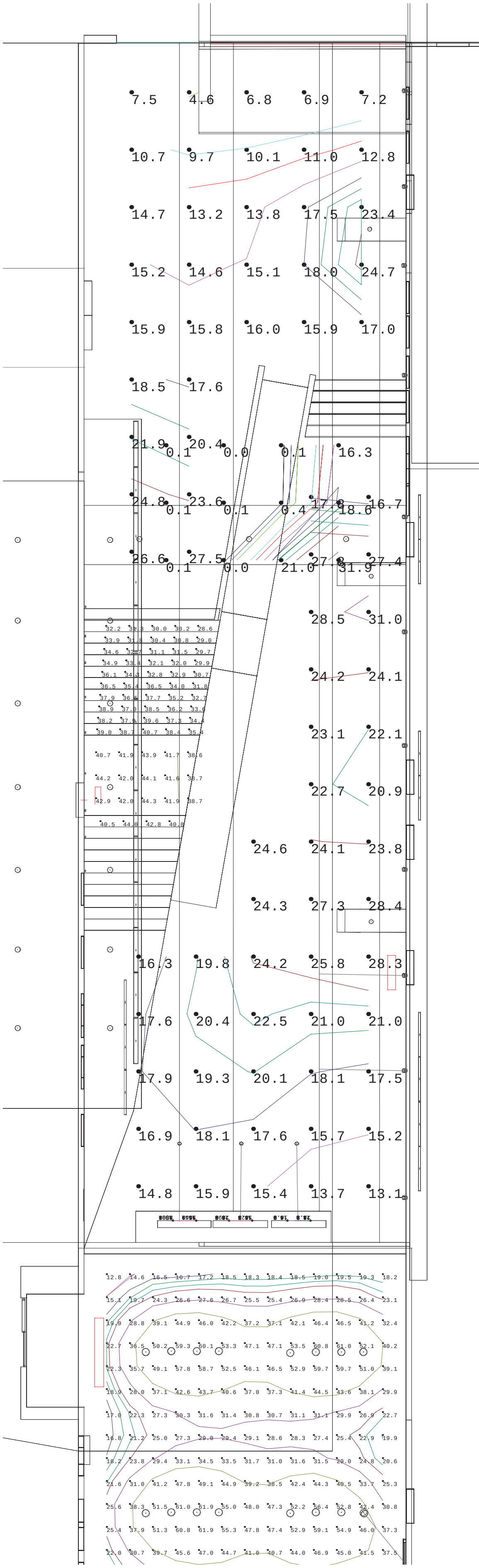
Type	Maintenance Category	Cleaning Interval	Initial Lumens	Mean Lumens	LLD	LDD	RSDD	BF	Total LLF
F04	IV	Clean 12 months	2900	2750	0.94	0.97	0.94	1	0.86
F05	VI	Clean 12 months	5000	4700	0.94	0.97	0.94	1	0.86
F08	VI	Clean 12 months	800	560	0.70	0.94	0.96	0.75	0.47
F10	IV	Clean 12 months	3200	2690	0.84	0.95	0.91	0.98	0.71
F17	IV	Clean 12 months	1030	825	0.80	0.95	0.91	0.98	0.68
F21	IV	Clean 12 months	825	620	0.75	0.94	0.94		0.66
F22	V	Clean 12 months	1030	790	0.77	0.88	0.96		0.65

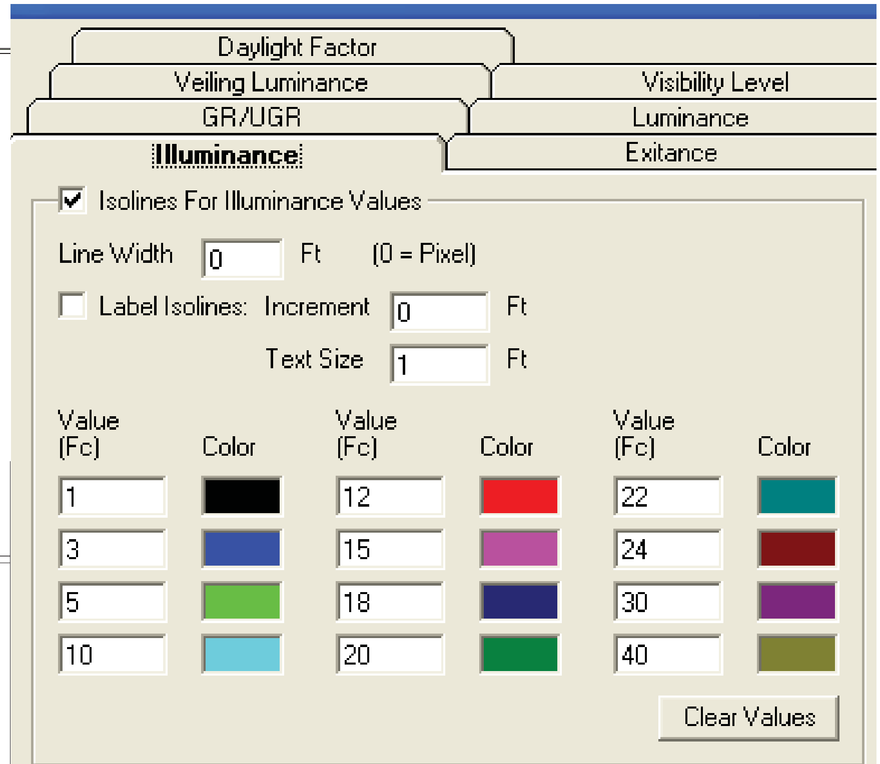
New Ballasts

Ballast ID	Ballast	Voltage	Lamp	Input Watts	Input Current	Fixtures	Electronic/Magn	Dimming	Manufacturer	BF
RLQS122TPW	Ballast 6	120	(1) 20w	24		F08	Magnetic	Fixed	Advancetransformer	0.75

Power Density

Location	Fixture	Quantity	Watts	Total Watts	Area (ft^2)	Power Density	Allowable
Lobby	F05	14	54	756			
	F08	9	24	216			
	F10	17	42	714			
	F17	14	100	1400			
	F21	50	50	2500			
	F22	3	75	225			
	F04	11	28	308			
				6119	4179	1.46	1.5





The light level on the ground floor is a little over the normal 10 fc. However, with the glass facade and the skylight running the length of the lobby the extra light will add to a better transition from the exterior. The location of the fixtures in this space was important due to the fact that the architecture has such clean lines. Wall sconces and other visible fixtures would not fit as well as streamlined fixtures. In the gallery space the track system is the most versatile lighting system with its ability to change with whatever is changing in the atmosphere.

Conclusions

This space is the first space where visitors enter and get their first impression of the new library. Providing a warm and welcoming environment is a priority. Adding light to the ceiling and wall surfaces throughout the space allows the space to feel even larger. The warm, welcoming spacious, environment is exactly the feeling that this space should portray.

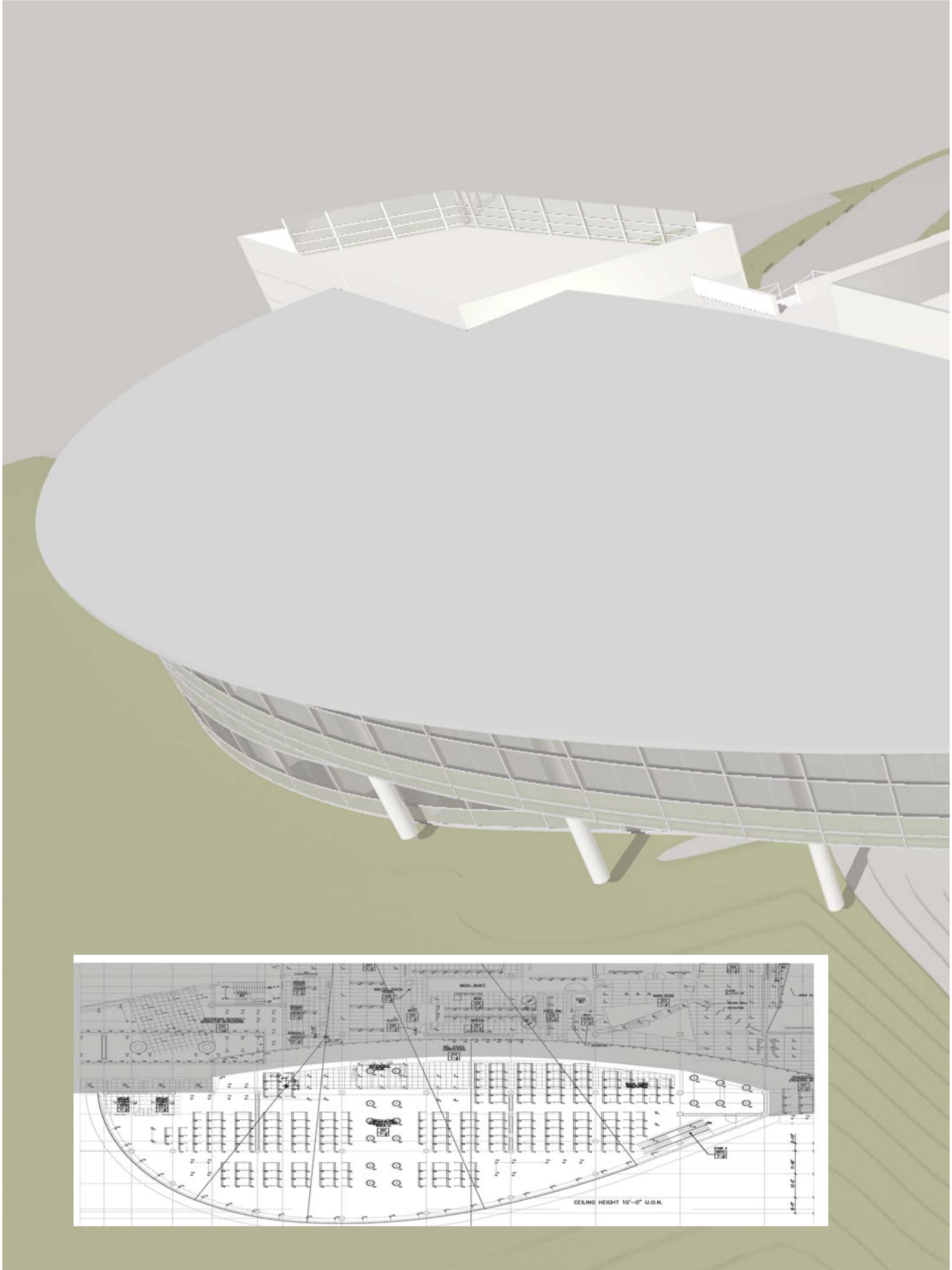
The Stacks

A Large Work Space

On the south side of the building lies the stack area on the second floor. This south façade is a glass SolarBan curtain wall. An integrated daylight system could be very useful in this space. The ceiling in this space is sloped downward towards the perimeter of the building. This space is primarily used for stacks and along the perimeter it is mostly used for studying at the single desks. Through the center axis of this space is the study area where group tables are located and end at the reference desk. Activities in this space include individual and group study, and reading in the stacks.

The architect's intent is to keep the sloped ceiling clean of fixtures. It would be more energy and cost efficient to pendant mount the fixtures because less hardware would be needed and each individual stack does not necessarily call for its own fixture. However in keeping with the architect's intention, the stacks are illuminated by T5HO stack mounted fixtures. Downlights are used around the perimeter of the area to achieve the necessary 30 fc on the desk plane. Decorative pendants add interest to the main axis of the stack group area while attaining the correct light level at the desk plane.

The south façade is a dominant feature in this building where daylight integration can become very useful. The south façade is a glass curtain wall made of Solarban 60 with ceramic frit. It is specifically designed to provide solar control, while still offering the traditional insulating performance and the benefits of low-emissivity coated glasses. Its window U-value is 0.28 while summer solar heat is 0.39 and has transmittances of ultraviolet energy is 0.16 and visible like is 0.71.


CEILING HEIGHT 10'-0" U.O.N.

DESIGN CR

- Daylighting Integration

In this space this is the most important element that has not been looked into as extensively as needed. The entire south façade is made of a Solarban 60 window which will allow natural daylight to light this space more than adequately for the majority of the time here. There are pendant mounted downlights that provide the individual desks with the proper light level needed to read and write, however the calculation done at the time did not take into account daylighting.

- Color Appearance and Color Contrast

Not as important in this space as in the other spaces because most of this area is for individual study.

- Direct Glare

The daylight while giving off this natural light will also cause a big glare problem for the students sitting next to the windows. It provides a direct glare source and will provide a reflected glare source as well off the desks. The glare cause by the luminaires is neglible compared to the glare cause by the daylight.

- Modeling of Faces and Objects

The modeling of faces isn't as important in this space because once again it is an individual space and most likely you aren't looking at yourself. However because the stacks usually give off an uneasy feeling already there is no reason why to add to it by bad facial modeling. While not as important as if you were in a meeting, but the safety factor of making someone appear normal in the stacks is worth it. But, the modeling of the books is of much importance because the main activity in this area is reading in the stacks.

RITERIA

- Reflected Glare

Reflected glare is very important in this space not only in the stacks but off of the desks that are placed by the windows. The desk specularity can be changed to help with reflected glare. At night there could be a potential problem with the pendant downlights reflecting off the glass, too.

- Illuminance (Vertical)

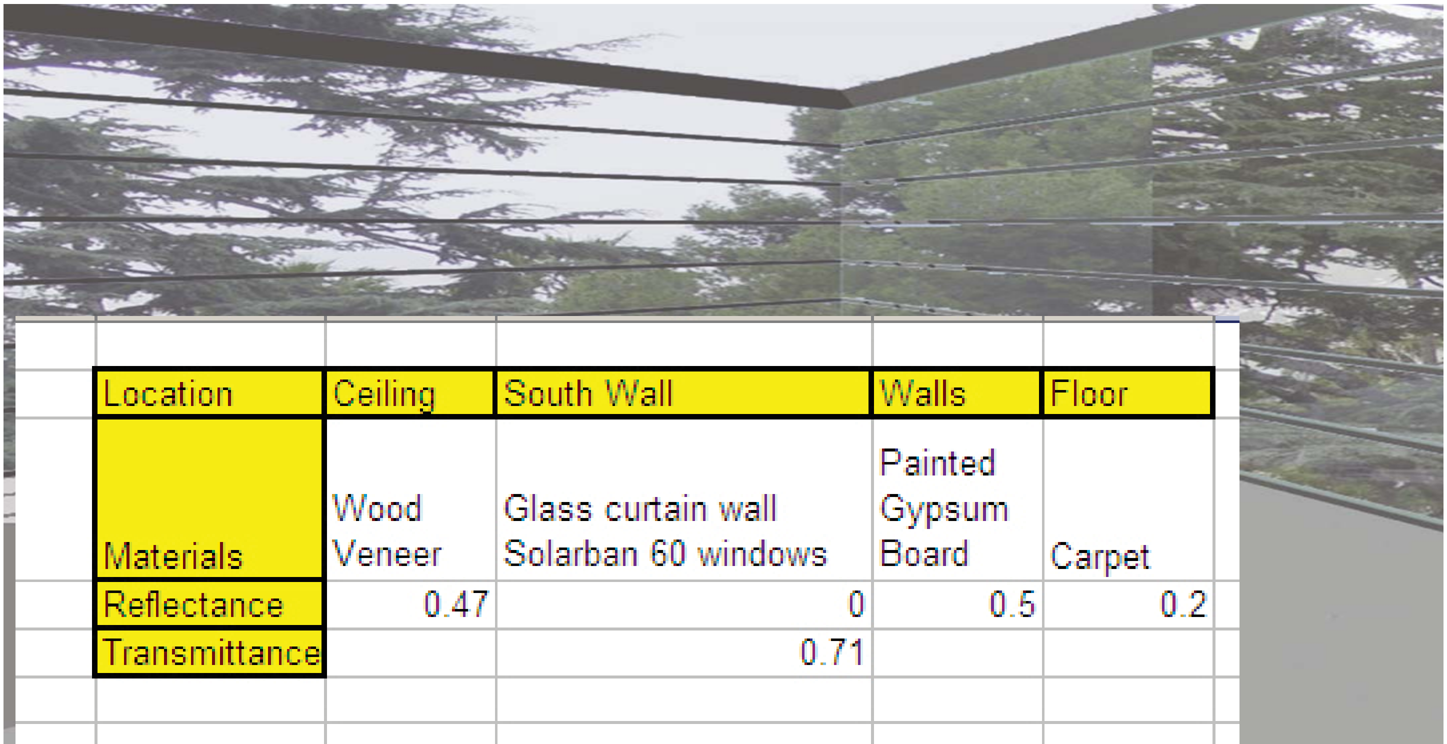
Vertical illuminance is highly important in this area due to the stacks. The architect wanted the stacks to be lit by stack mounted linears to keep the ceiling free from fixtures. The stack light is a 54w HO to really push that light towards the bottom shelf so the books on the bottom see the correct light level. The ratio from top to bottom needs to be minimal on the stacks so as to put

- Illuminance (Horizontal)

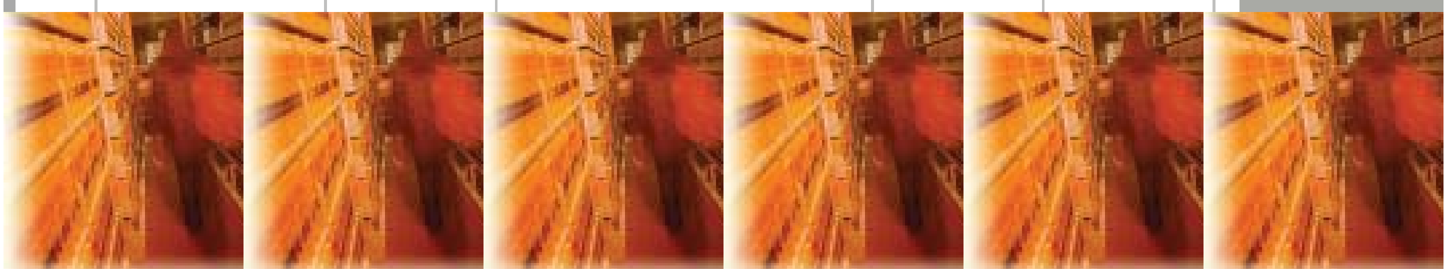
Horizontal illuminance should not fall below 30 fc on the work plane to achieve the tasks that take place in this area. In the corridor areas, on the ground between the stacks the light level does not need to exceed 5 fc to walk.

- Title 24

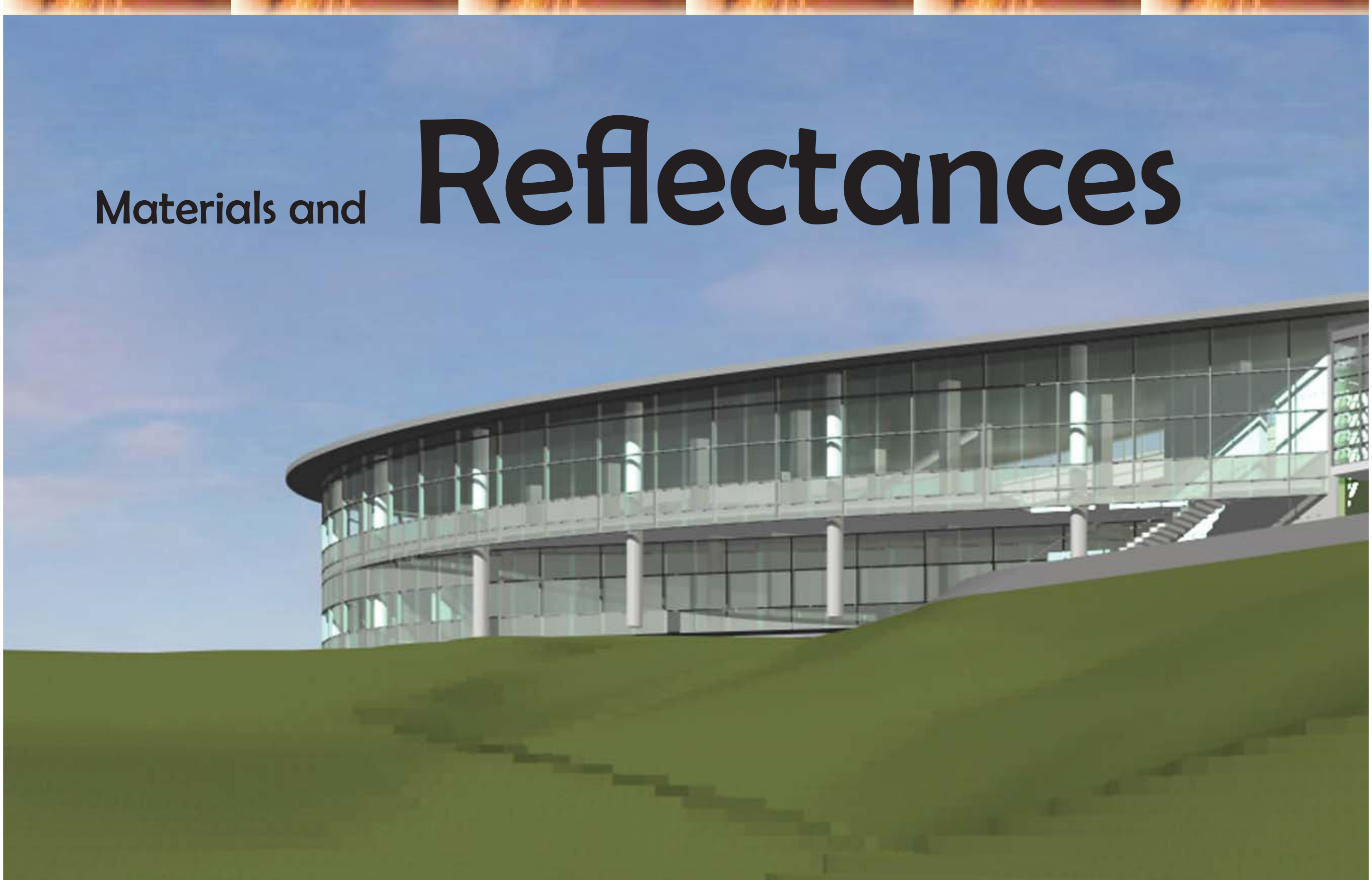
According to ASHRAE 90.1, the stack area allows for a maximum allowance of 18,616 watts. Currently the wattage for the stack area is 21276 total watts. This is neither ASHRAE compliant nor Title 24 compliant, so this will need to be addressed. For LEED certification, the wattage needs to be ten percent lower than the Title 24 allowance, so low-

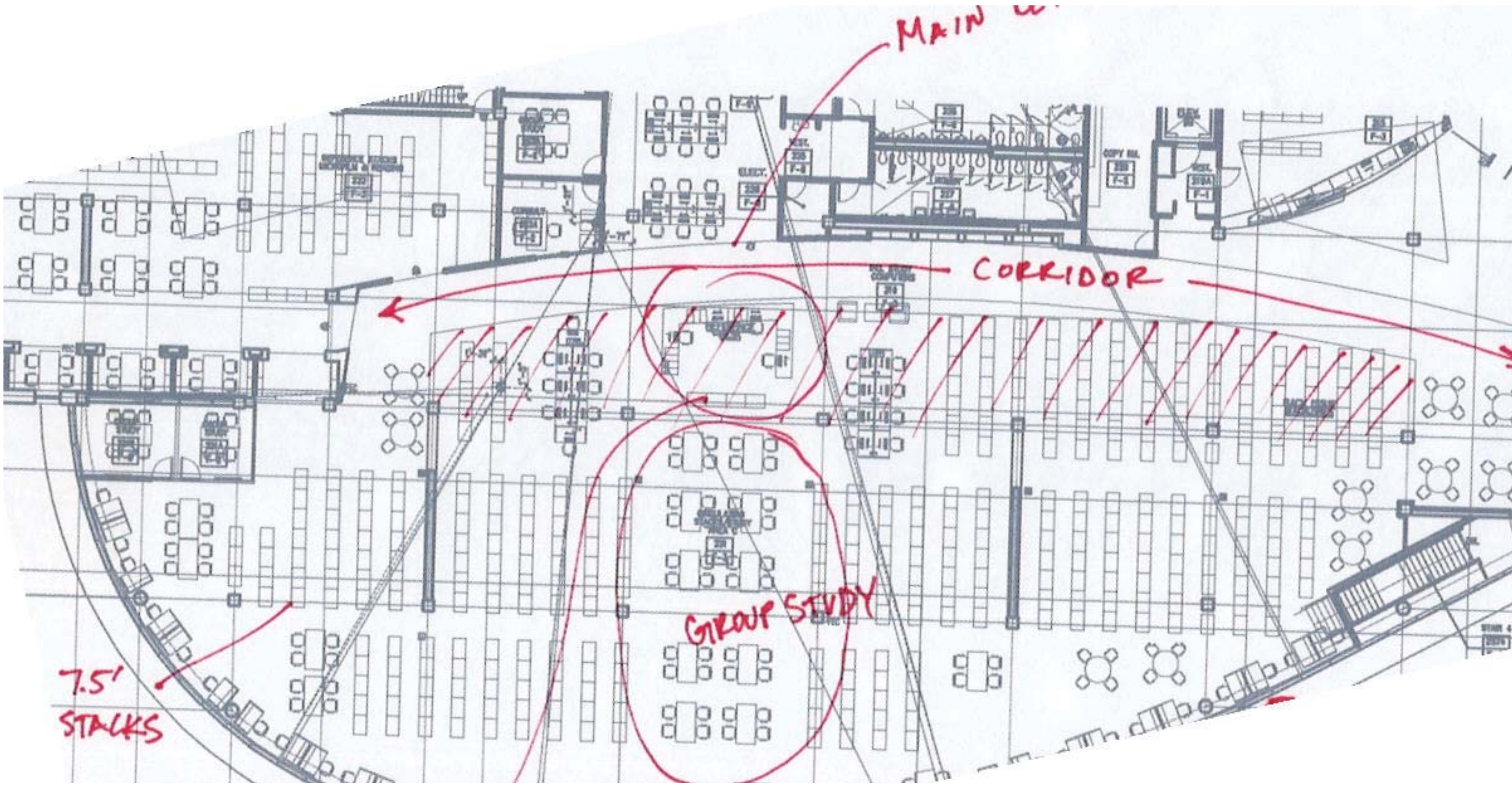


Location	Ceiling	South Wall	Walls	Floor
Materials	Wood Veneer	Glass curtain wall Solarban 60 windows	Painted Gypsum Board	Carpet
Reflectance	0.47	0	0.5	0.2
Transmittance		0.71		



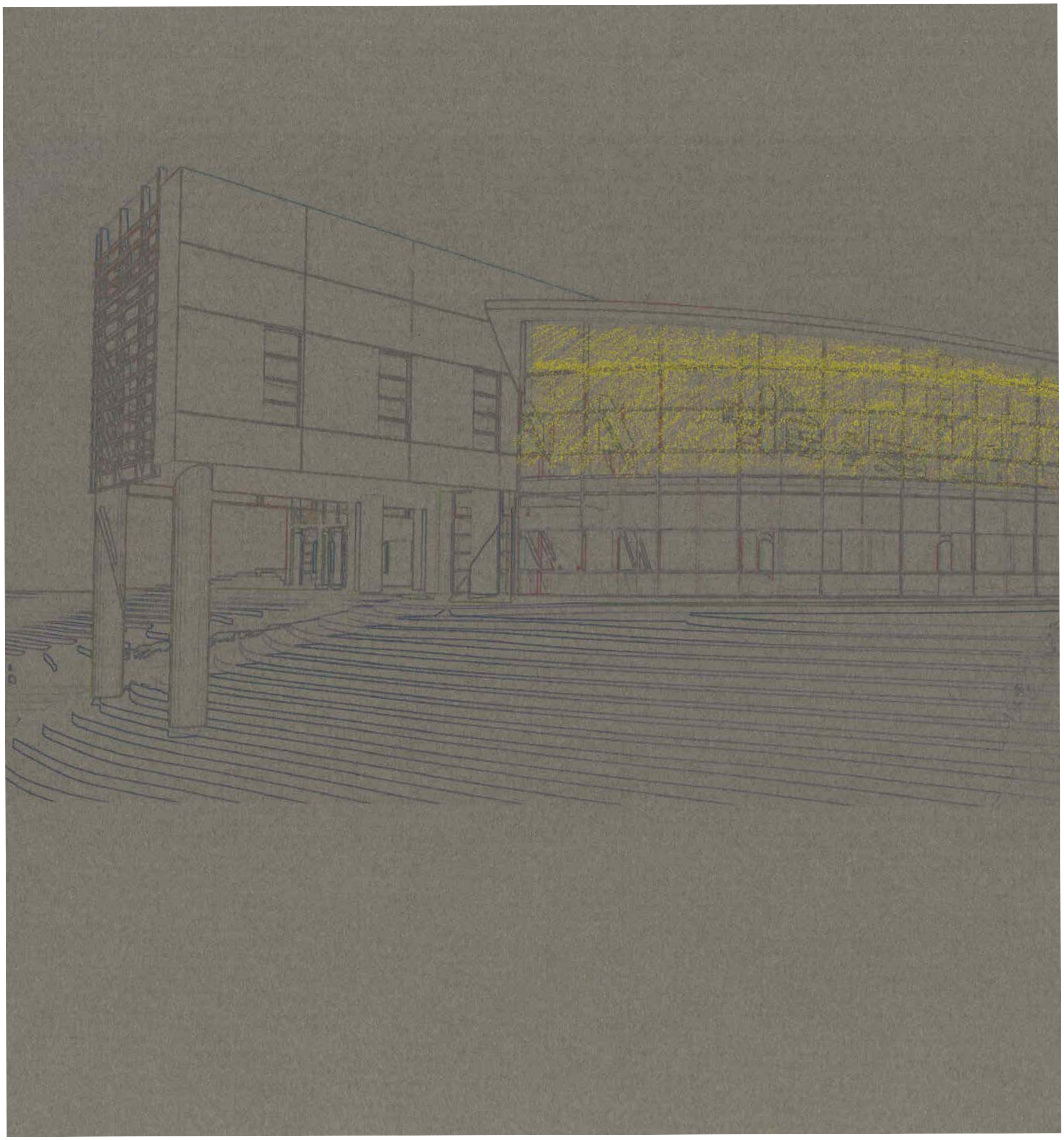
Materials and Reflectances





Designing the stack area lighting scheme was the most difficult part in this thesis because it brought challenges that were unfamiliar. Not only is placement important for the luminaire but also the luminaire itself has to be efficient. In the redesign, the stack mounted fixtures were replaced with linear up/down lights. Choosing the up/down lights will help with the cave-like feeling often felt in tight spaces with only downlights. The ceiling slops to a clerestory of 20' so having the indirect portion of the light will open the space and throw light on the ceiling. The south façade of the library is a glass curtain wall that will also act as a beacon when the interior surfaces are lit. Direct pendants march through the main axis of walkway to achieve the necessary light level for the student group tables. Downlights are used around the perimeter to achieve the correct light level for the individual desks. Cove lights were added to the floating ceiling to add another layer of light onto the ceiling while also providing the necessary amount of light onto the corridor.

Design Process



Goal of Space

Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
D01	Fluorescent	Decorative Pendant - 3'	"Club C" series, Deltalight, Halospot 111, Alu-reflektor	75w	(4) 75w	82	3500
F10	Fluorescent	Recessed 6" Downlight	5-11/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	42w	(1) 42w TT	82	3500
F13	Compact Fluorescent	Surface Mounted Cylinder - 6"	Medium beam distribution, haze Alzak reflector	42w	(1) 42w TT	82	3500
F14	Fluorescent	Stack Light	Metro series, up down light	54w	(2) 54w T5HO	85	3500
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F04	Fluorescent	Recessed 1x4 Wallwash Troffer	"Avenue A" series	28w	(1) 28wT5	82	3500

My power density is over the allowed wattage but will be compensated by the dimming controls. During library hours many of luminaires will not be at full output.

Ballast ID	Ballast	Voltage	Lamp	Input Watts	Input Current	Fixtures	Electronic/Magnetic	Dimming	Manufacturer	BF
Es5840K	Ballast 6	120	(1) T5	63	0.53	F05	Electronic	Yes	Universal	1
Es5000HT	Ballast 5	120	(1) 42w TT	44	0.34	F10	Electronic	Yes	Universal	1
Es5000HT	Ballast 7	120	(1) 42w TT	44	0.34	F13	Electronic	Yes	Universal	1
Es5840K	Ballast 8	120	(2) T5	126	0.53	F14	Electronic	Yes	Universal	1
ES5842K	Ballast 9	120	(1) 28w T5	37	0.3	F04	Electronic	Yes	Universal	1

Power Density

	Location	Fixture	Quantity	Watts	Total Watts	Area (ft^2)	Power Density	Allowable
41	Stack	F05	31	54	1674		1.696728854	1.5
		F10	30	44	1320			
	200	F14	130	126	16380			
		D01	6	200	1200			
		F13	11	44	484			
					21058	12410.94		


9.6 68.0 64.8 58.5 53.0 49.5 47.6 46.8 46.4 46.6 46.7 48.9 53
70.3 68.3 65.1 58.2 51.2 47.6 46.4 45.4 45.3 45.3 45.4 47.9
45.5 46.6 39.9 38.3 41.2 36.0 29.6 23.7
50.9 47.3 44.7 43.2 41.0 36.9 28.1 20.4
50.3 46.1 43.0 41.2 39.3 35.1 26.6 19.3
42.4 41.8 36.3 33.7 35.4 30.3 23.6 18.1
40.0 42.2 31.4 24.7 52.0 26.6 22.0 16.1
42.0 37.9 35.4 33.8 32.2 29.8 22.9 15.9
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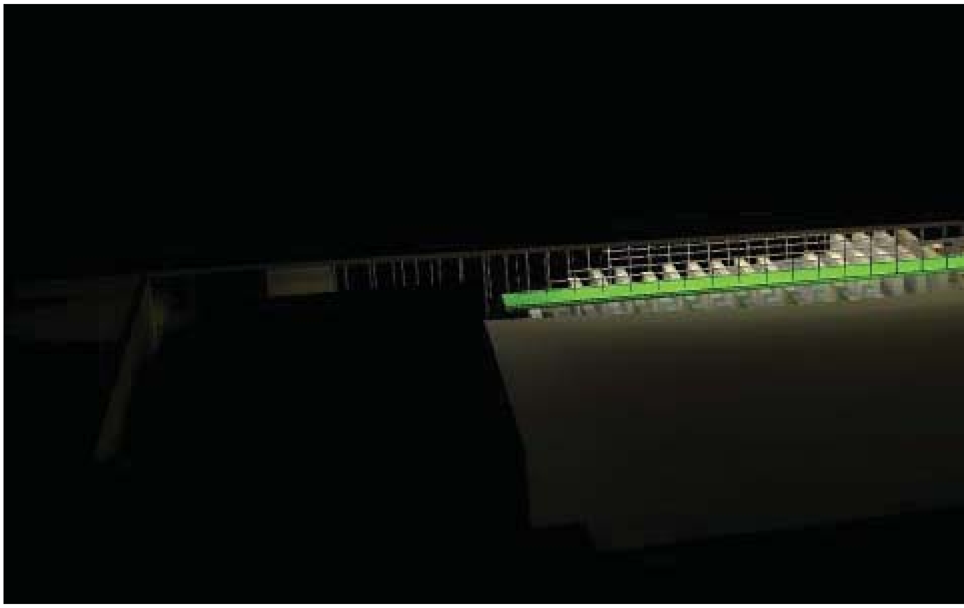
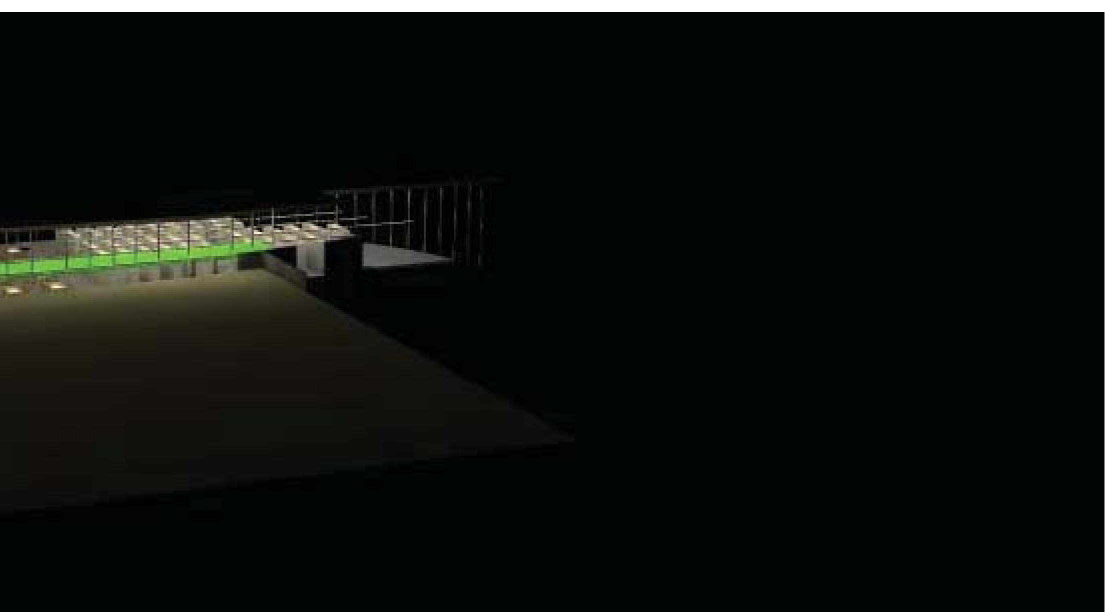
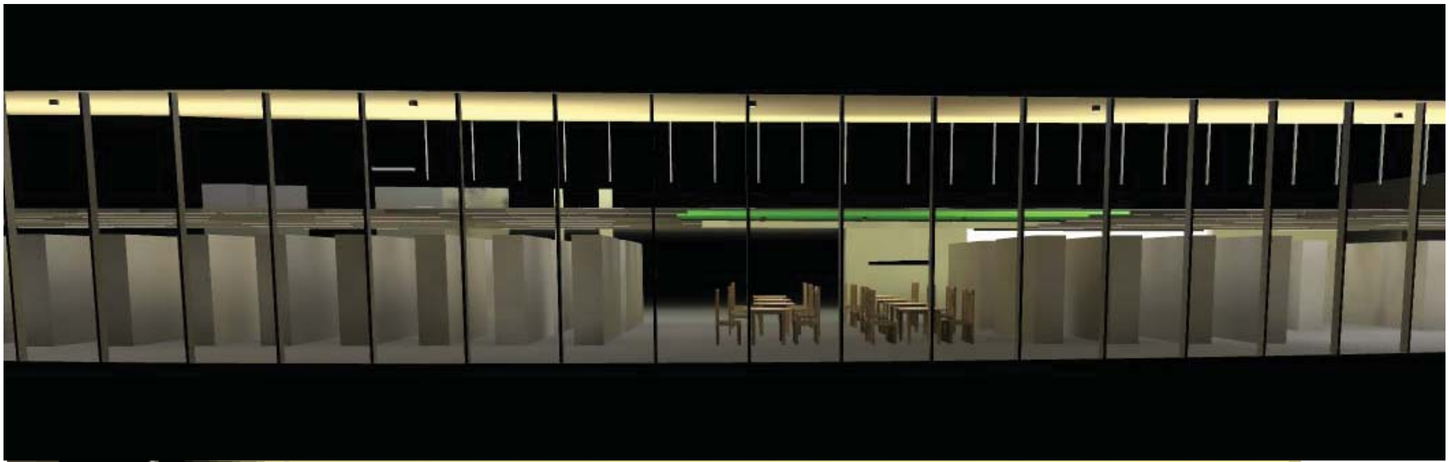
38.1 34.4 31.9 30.7 29.3 28.4 28.6 32.1







Conclusions

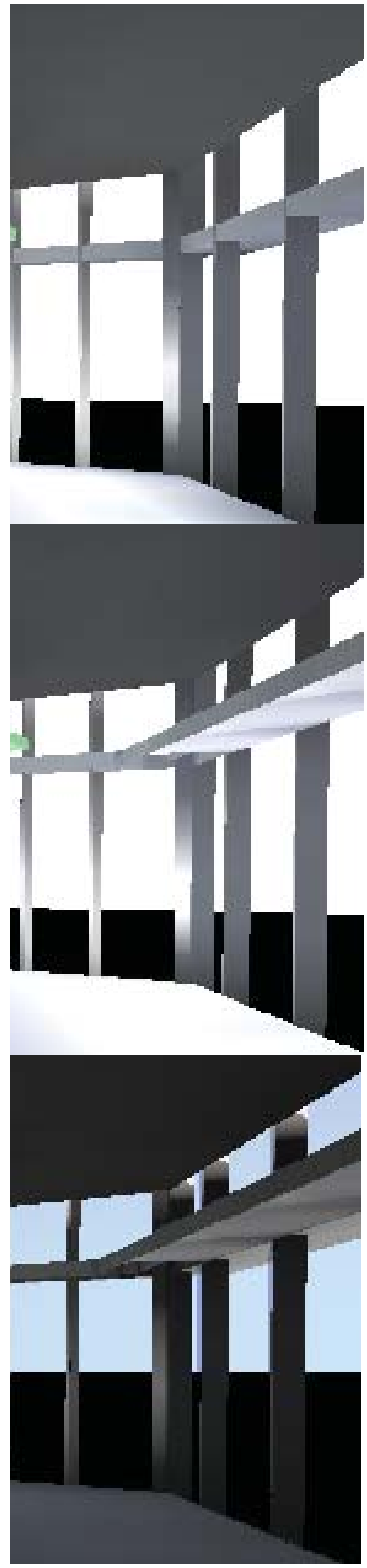
The use of indirect/direct pendants instead of the stack mounted fixture proves to be a better solution in throwing light on all surfaces to relieve the cave effect.

Daylight Analysis

Which is better?

Daylight is a useful tool and can be manipulated to be advantageous. The major objectives for the daylight system s are to redirect daylight further into the space so more fixtures can be dimmed thus saving on energy, improving visual comfort with glare control for the students sitting at the window's mercy, and achieving thermal control.

Rio Hondo is a great site for a daylighting building due to the site and location of the building. Sitting atop a hill, the library has few obstructions to become a great daylighting building. Having the sunny and clear skies of Southern California is also an advantage for the system. The architecture already plays into this with the glass façade, skylights, and clerestories.



Three different systems were investigated. Light shelves were put to the daylighting test. All light shelves were positioned so views were not lost in the spaces.

The interior daylight shelf redirects and reflects light, and reduced the amount of light received in the interior compared to the window alone.

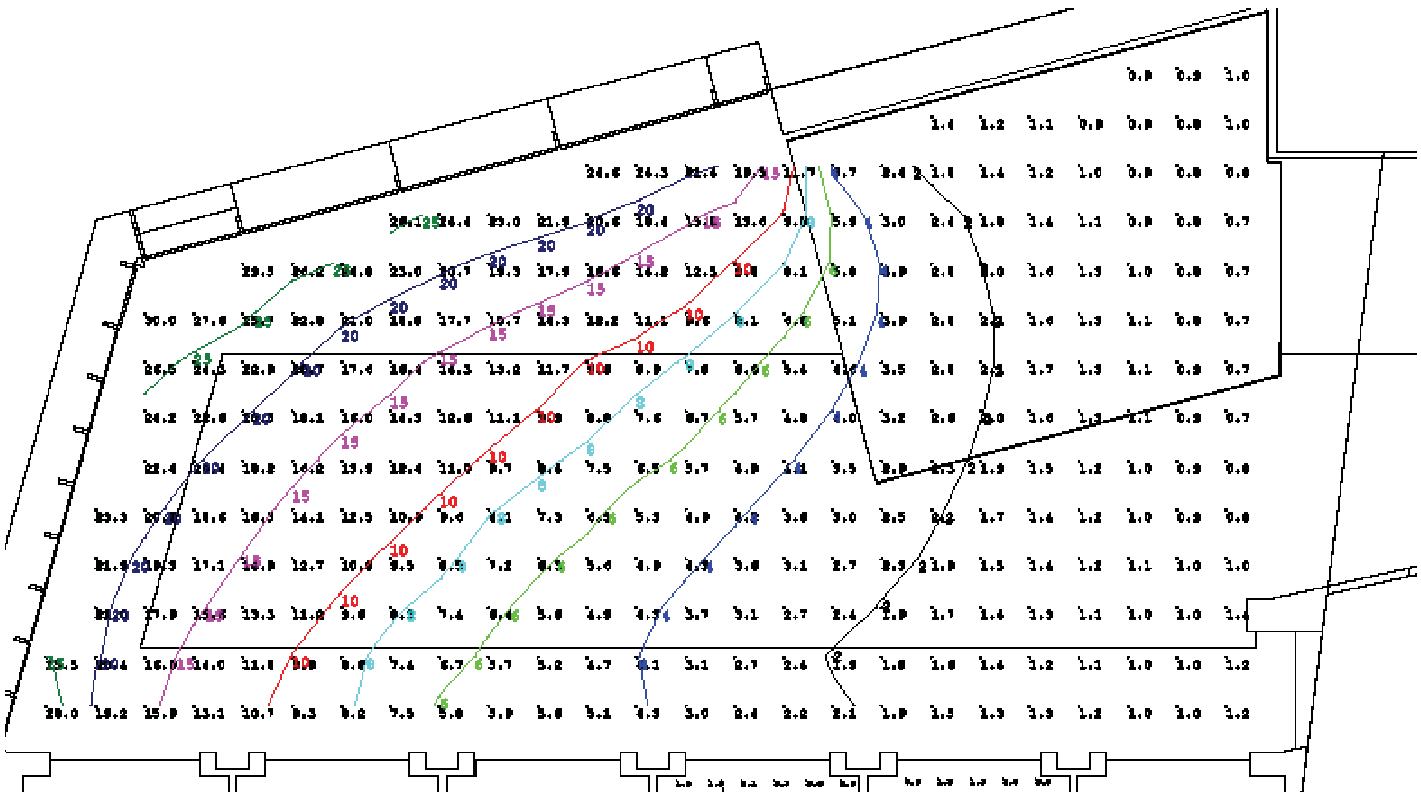
The purpose of the external light shelf is to increase the total amount of daylight in the space compared to the window alone.

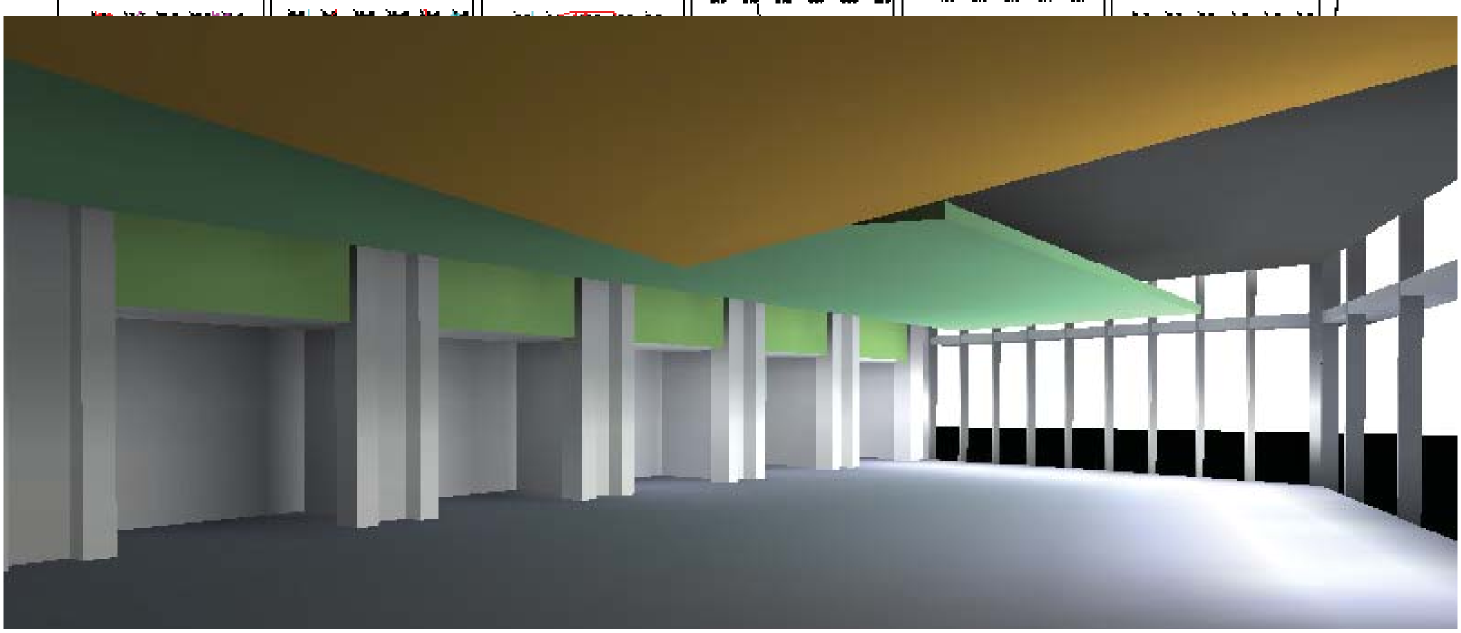
Combining the systems into an interior/exterior shelf could have both the benefits.

A daylight study was conducted for Feb 21 at 8:00 am, 11:00 am, and 3:00 pm. Light shelves output were then compared.

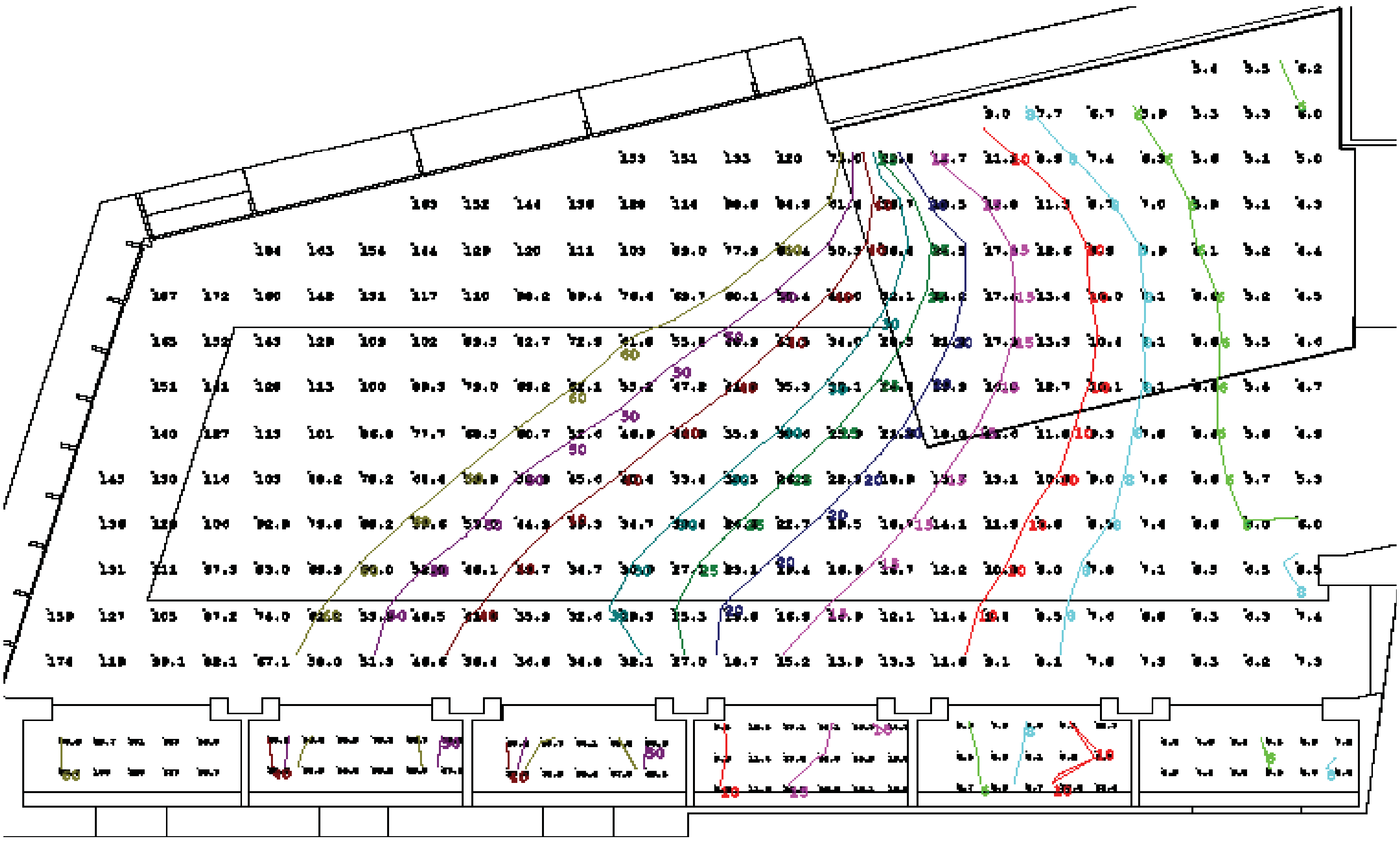
Exterior Shelf

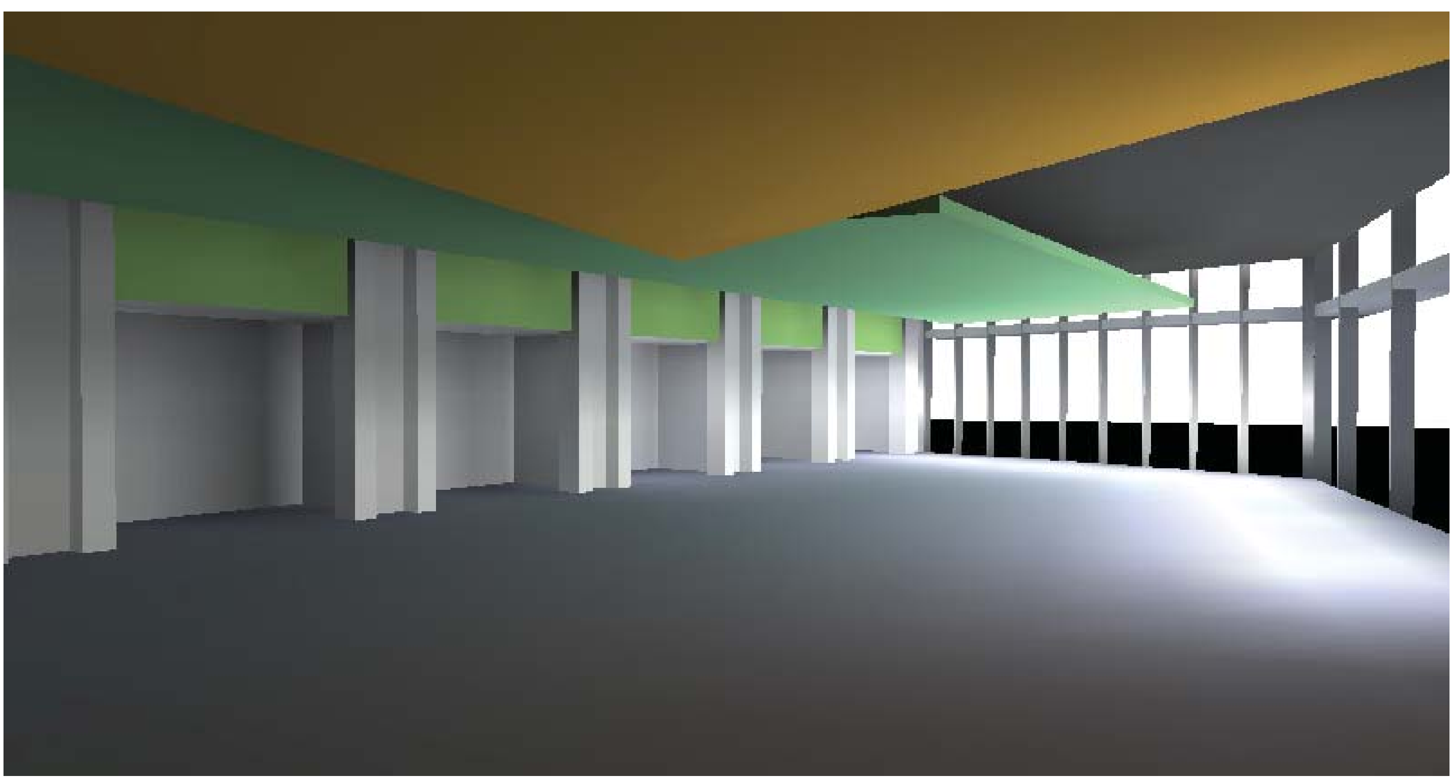
8:00 am



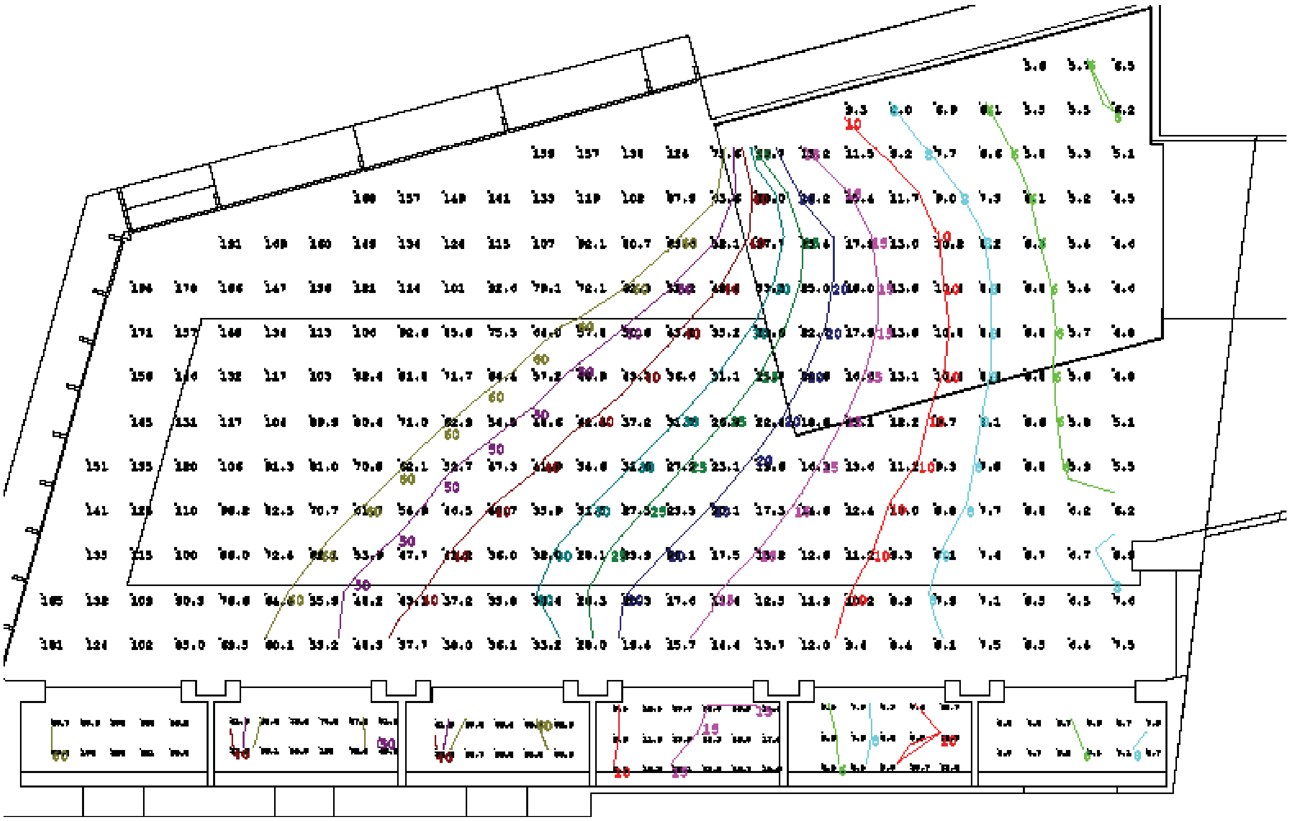


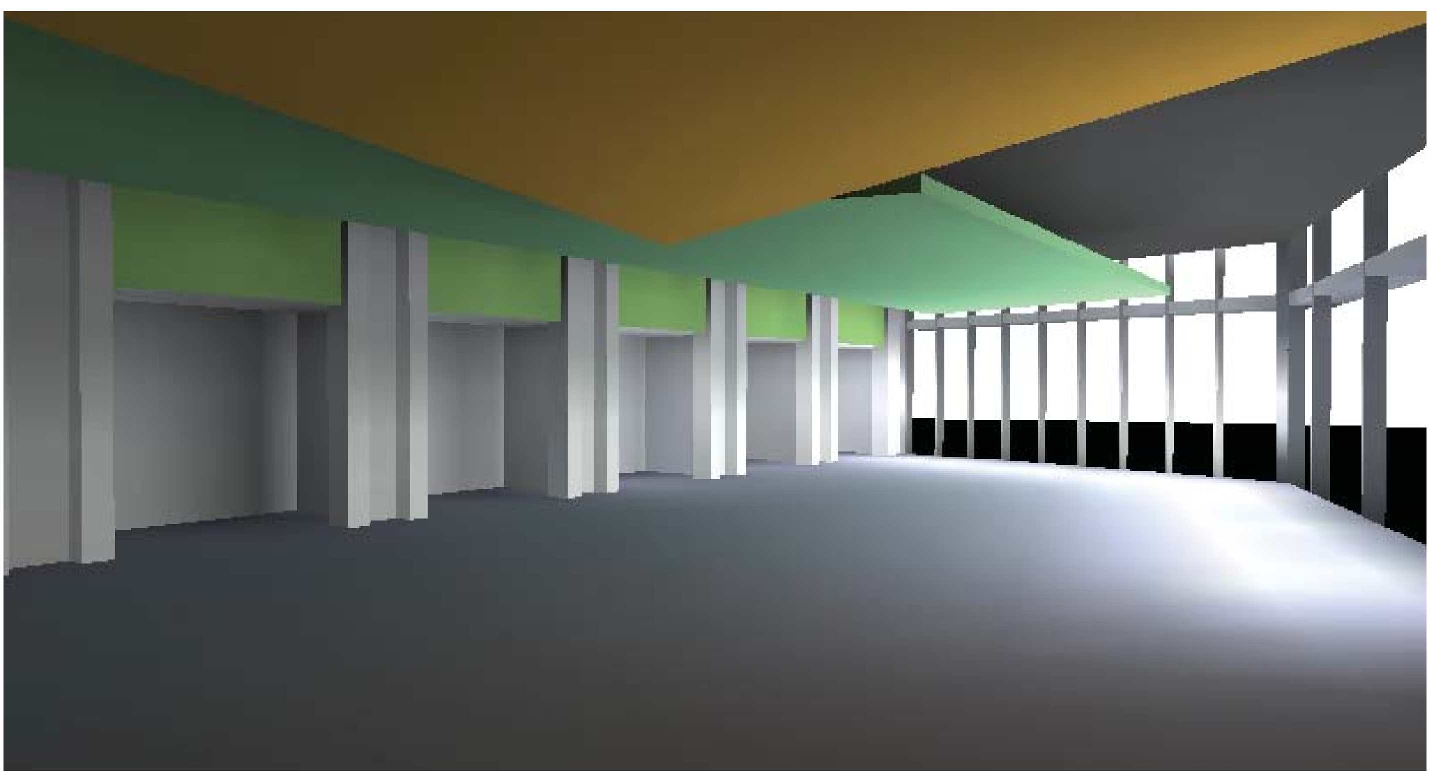
11:00 am





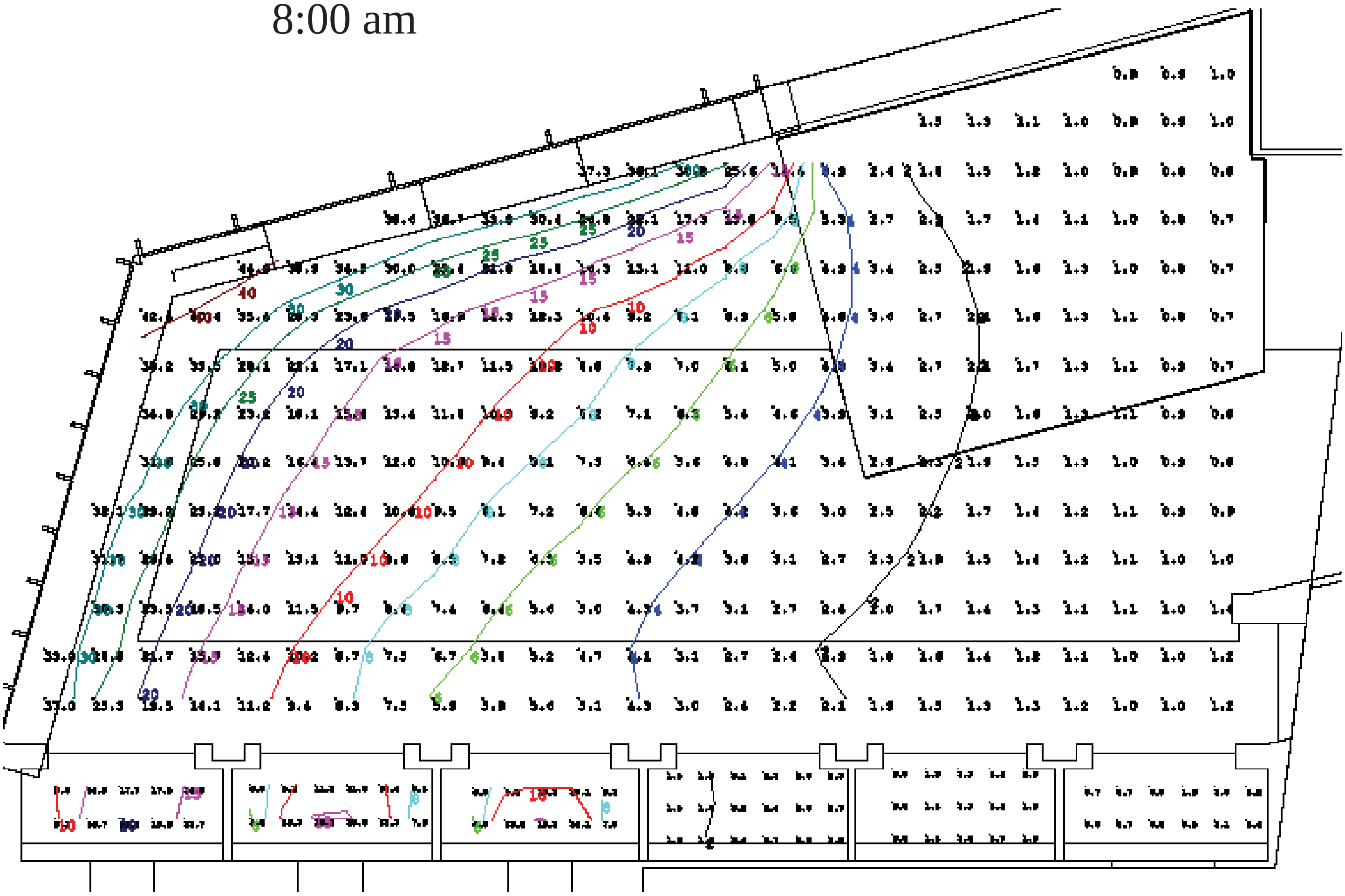
3:00 pm

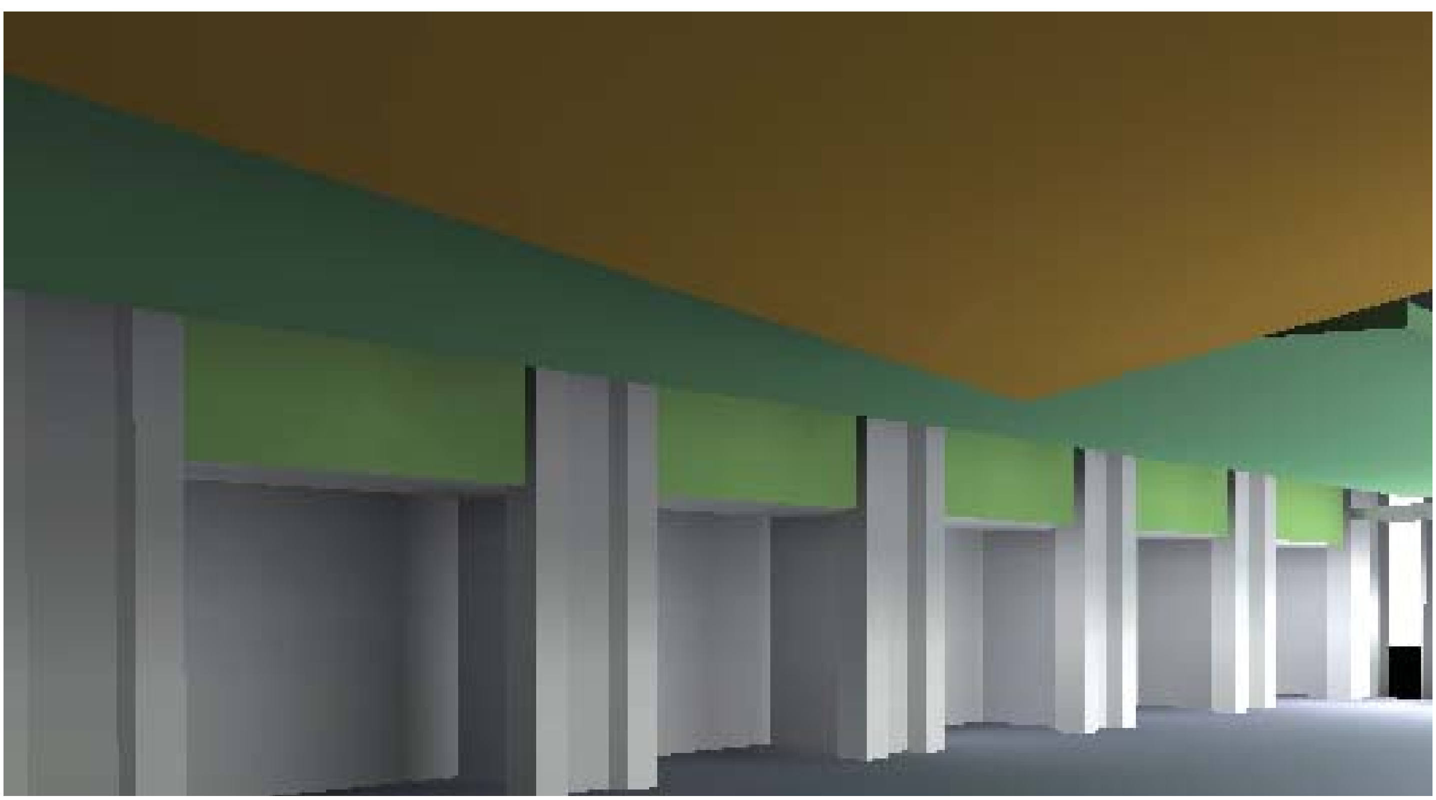




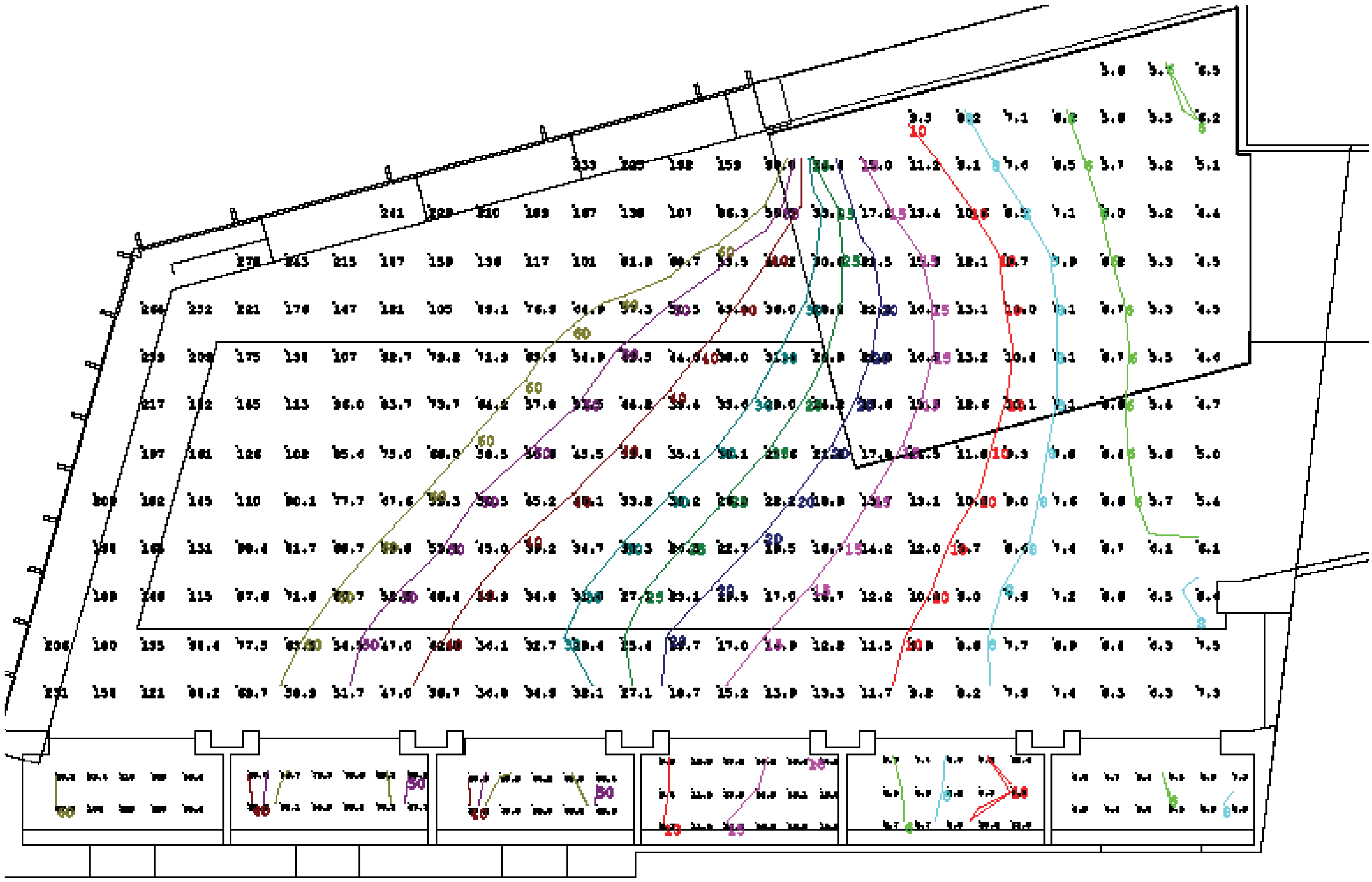
Interior Shelf

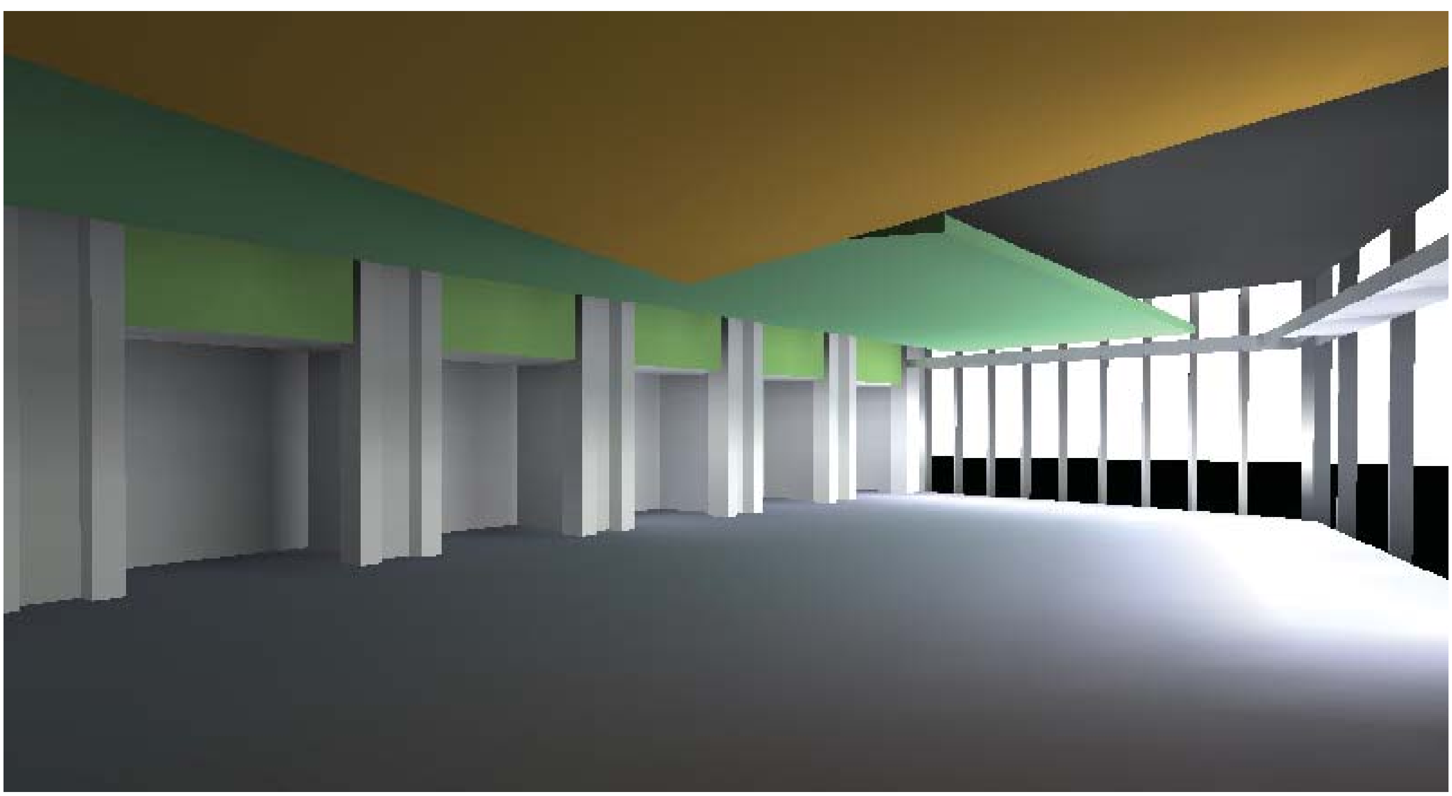
8:00 am





11:00 am





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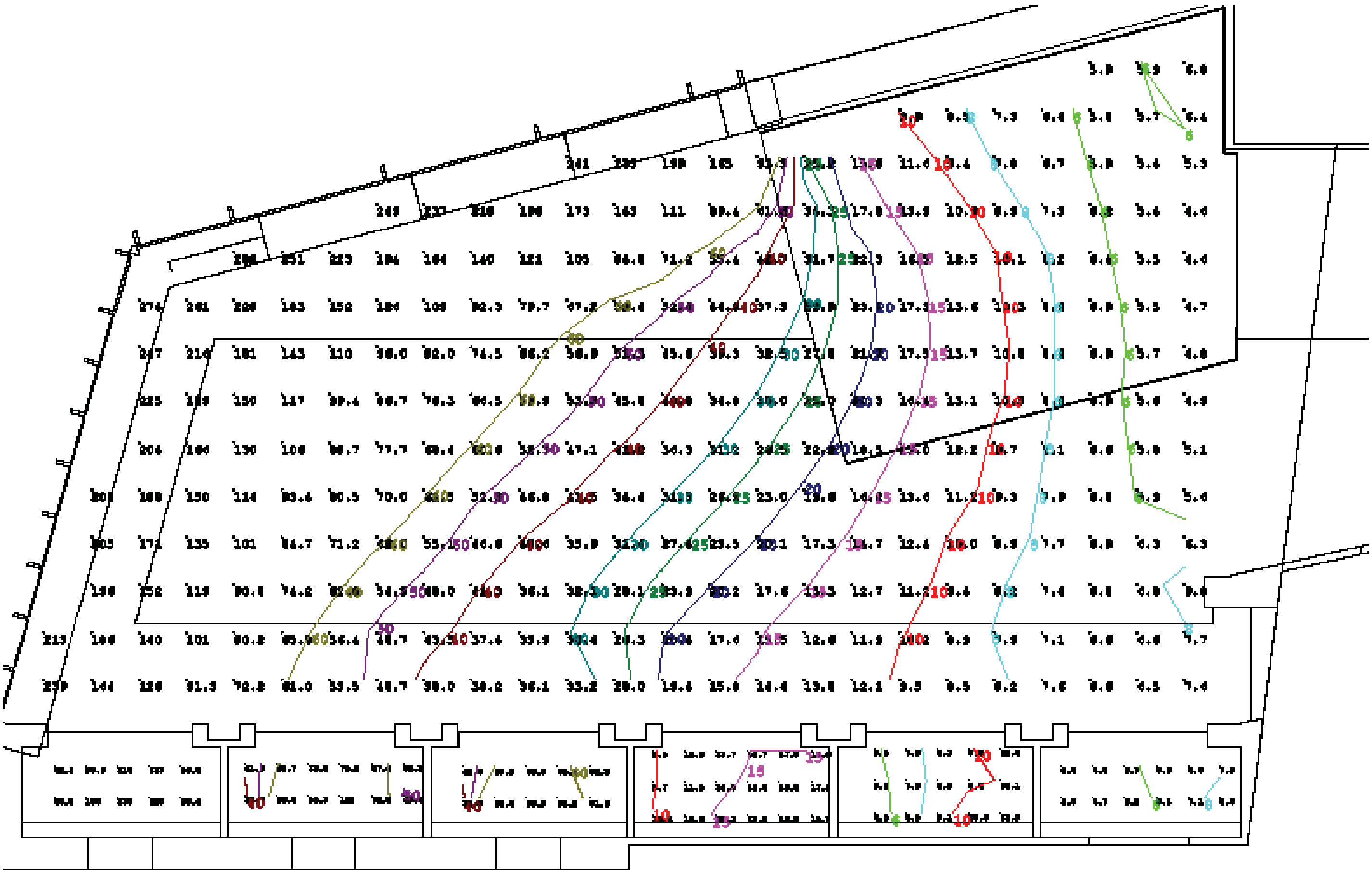
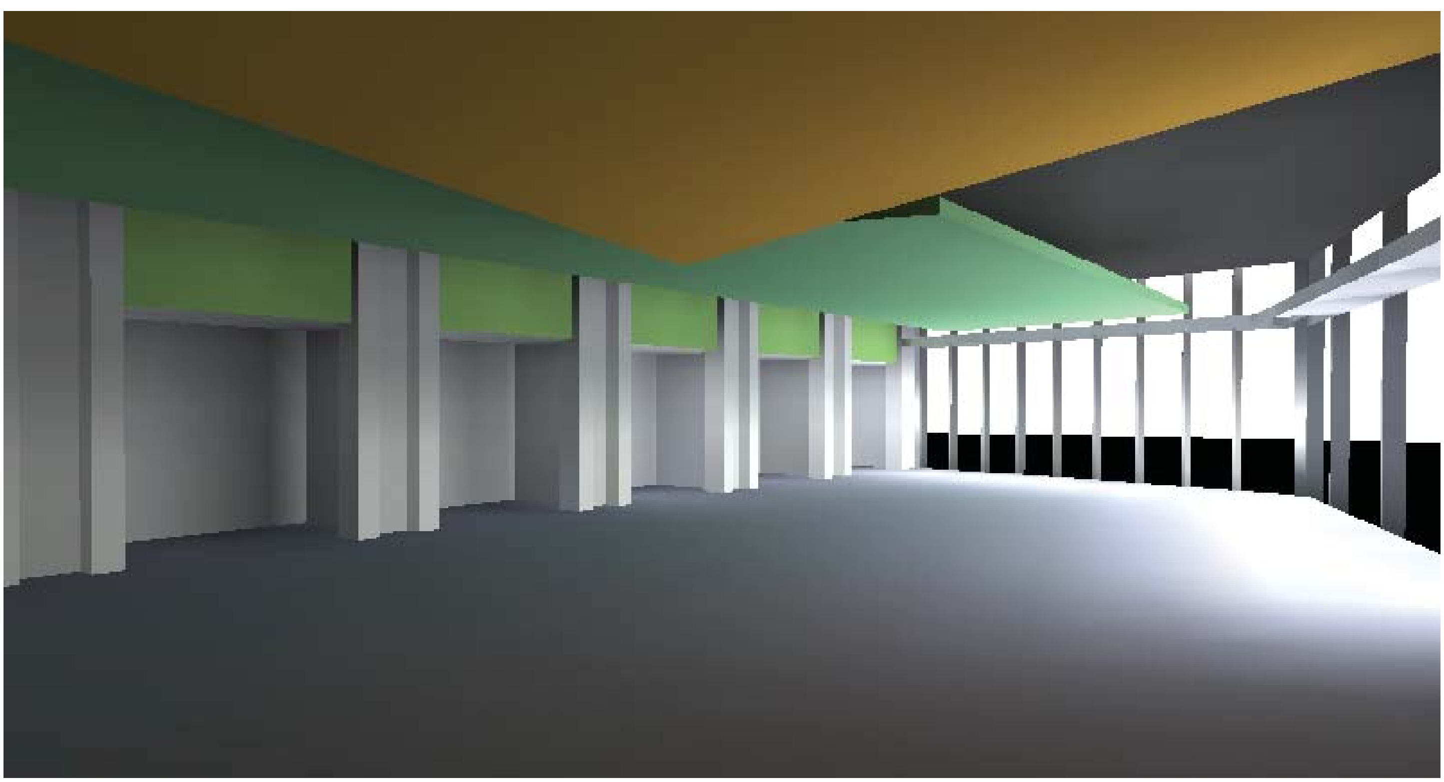
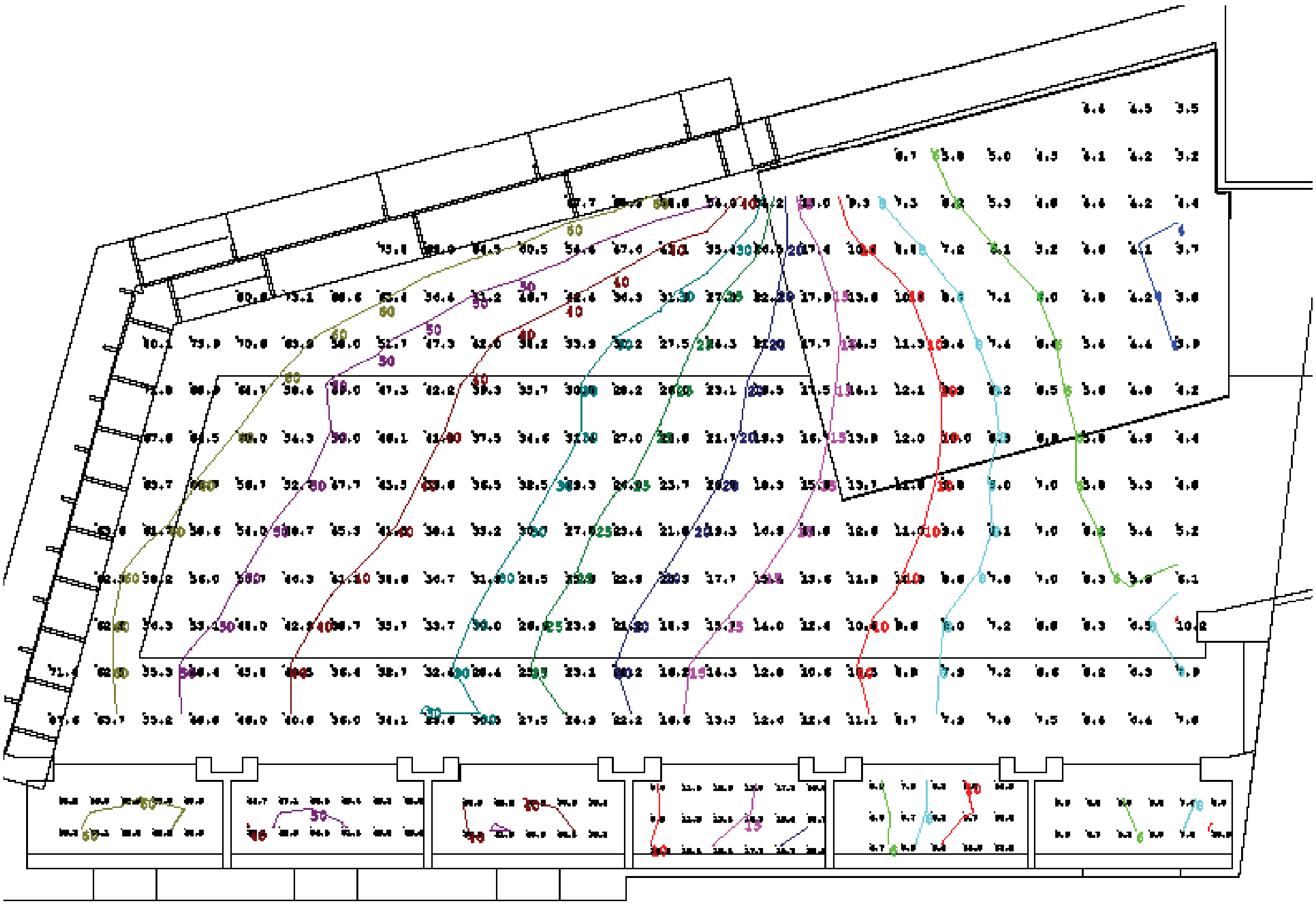
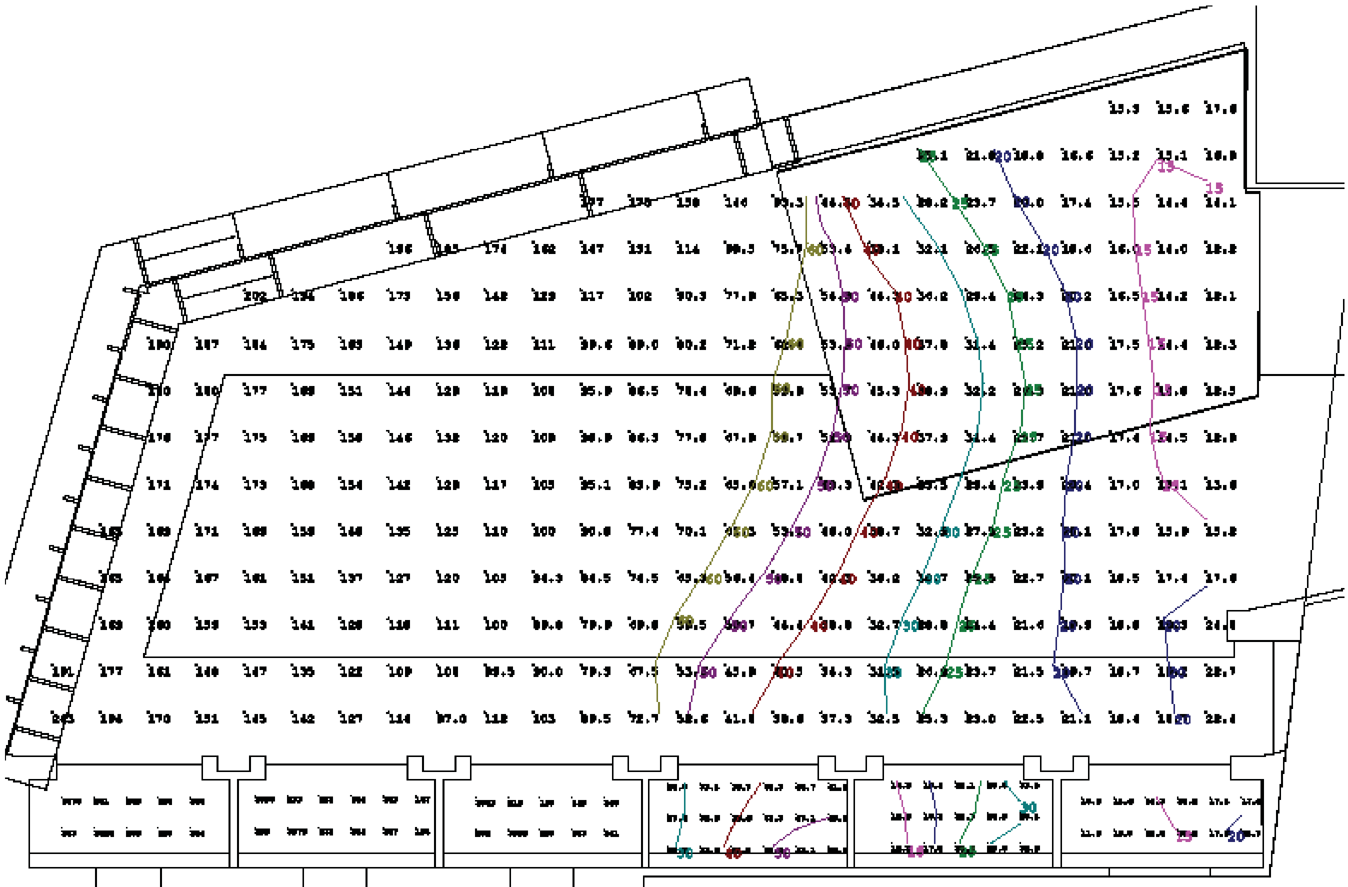




Interior/Exterior Shelf
8:00 am



11:00 am



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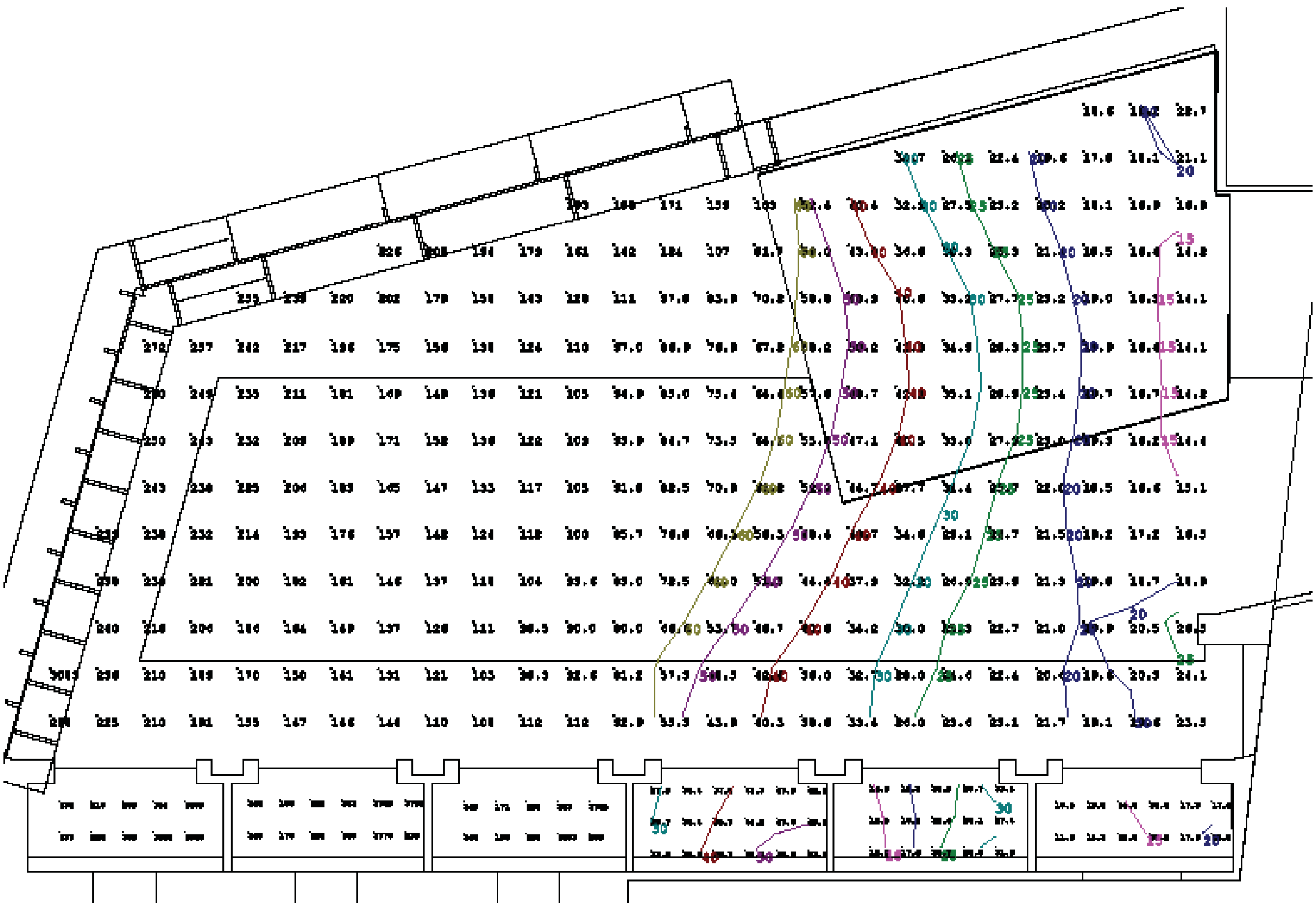
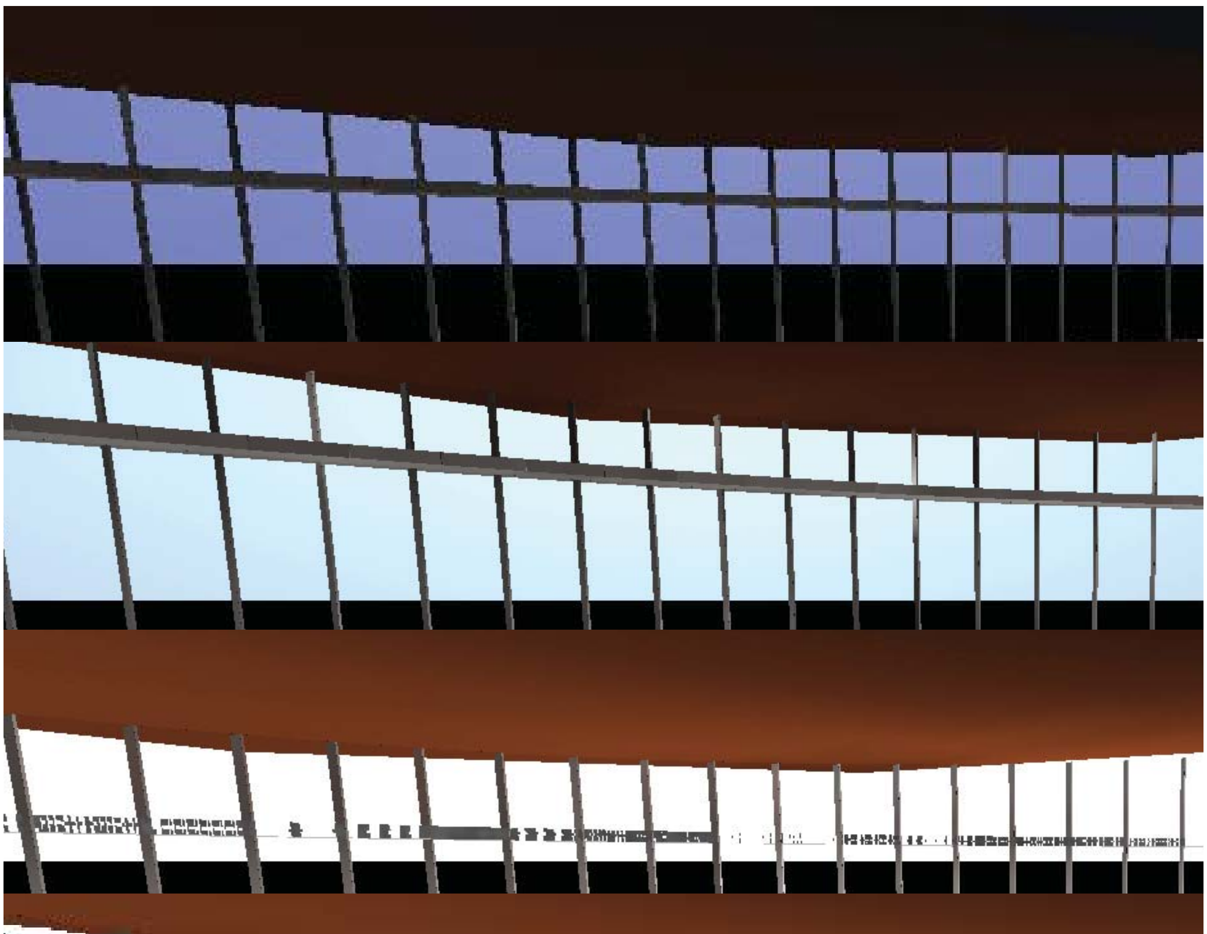


Conclusions

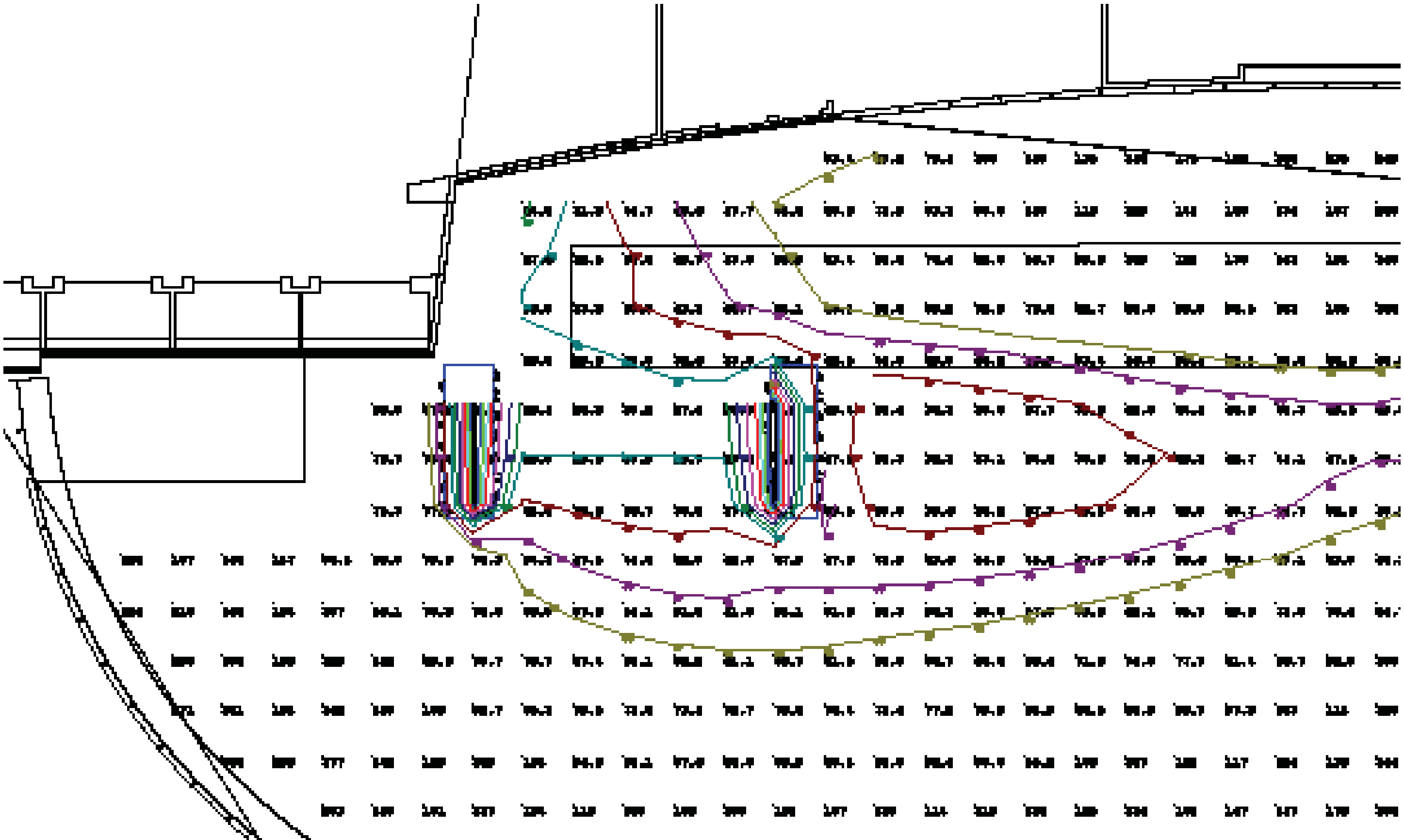
Seeing how the different systems differed under the same conditions was interesting. After seeing how each system was tested the choice was the interior shelf. This shelf aids in avoiding glare because it cuts off the direct sun angles at the student's that use the workspace along the perimeter. The shelf also directs a good amount of light further into the space. The electrical zoning control will be based on the zones of daylight into the area. Further information can be found in the electrical section of the report.

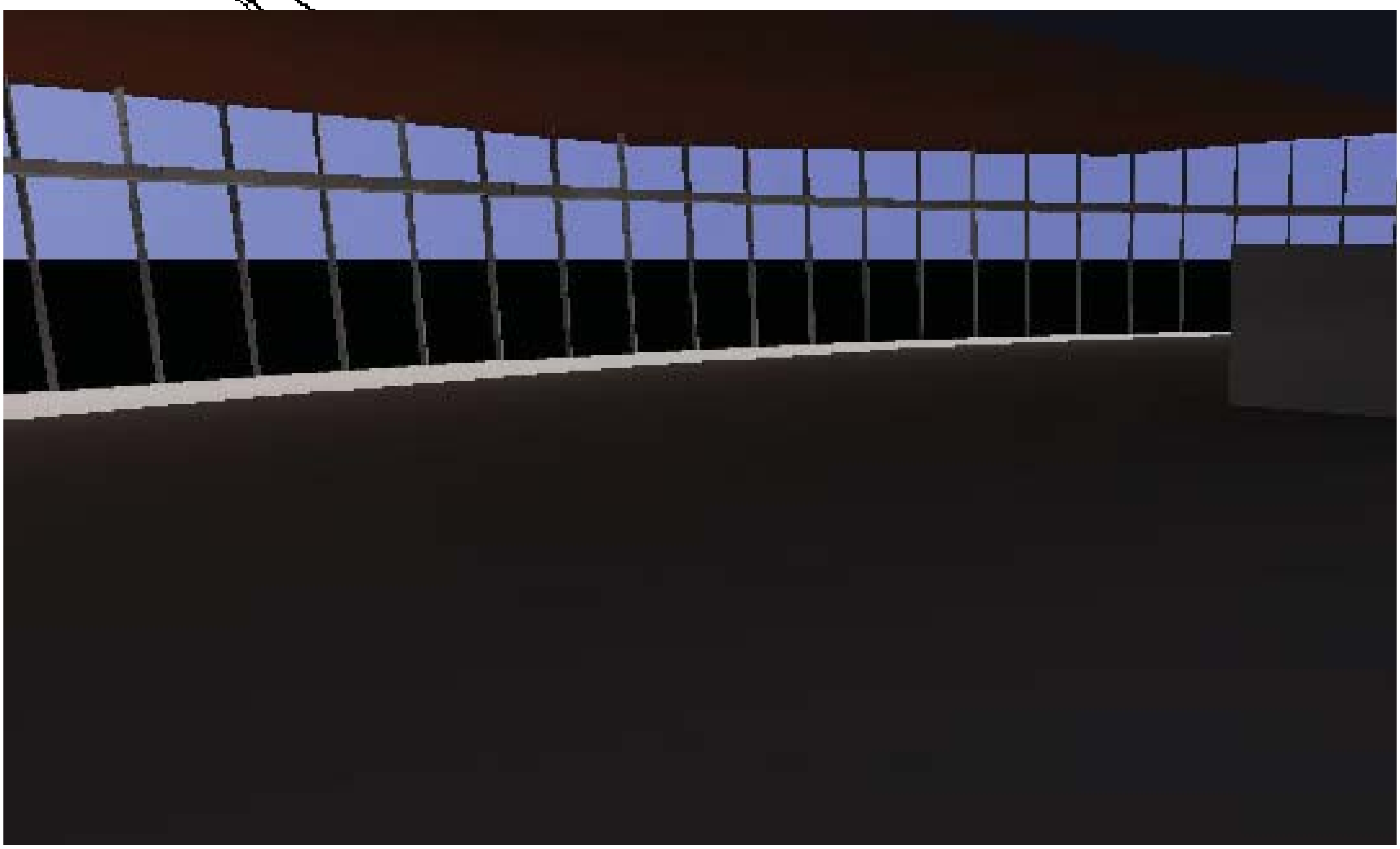
Stack Area

Which is better?

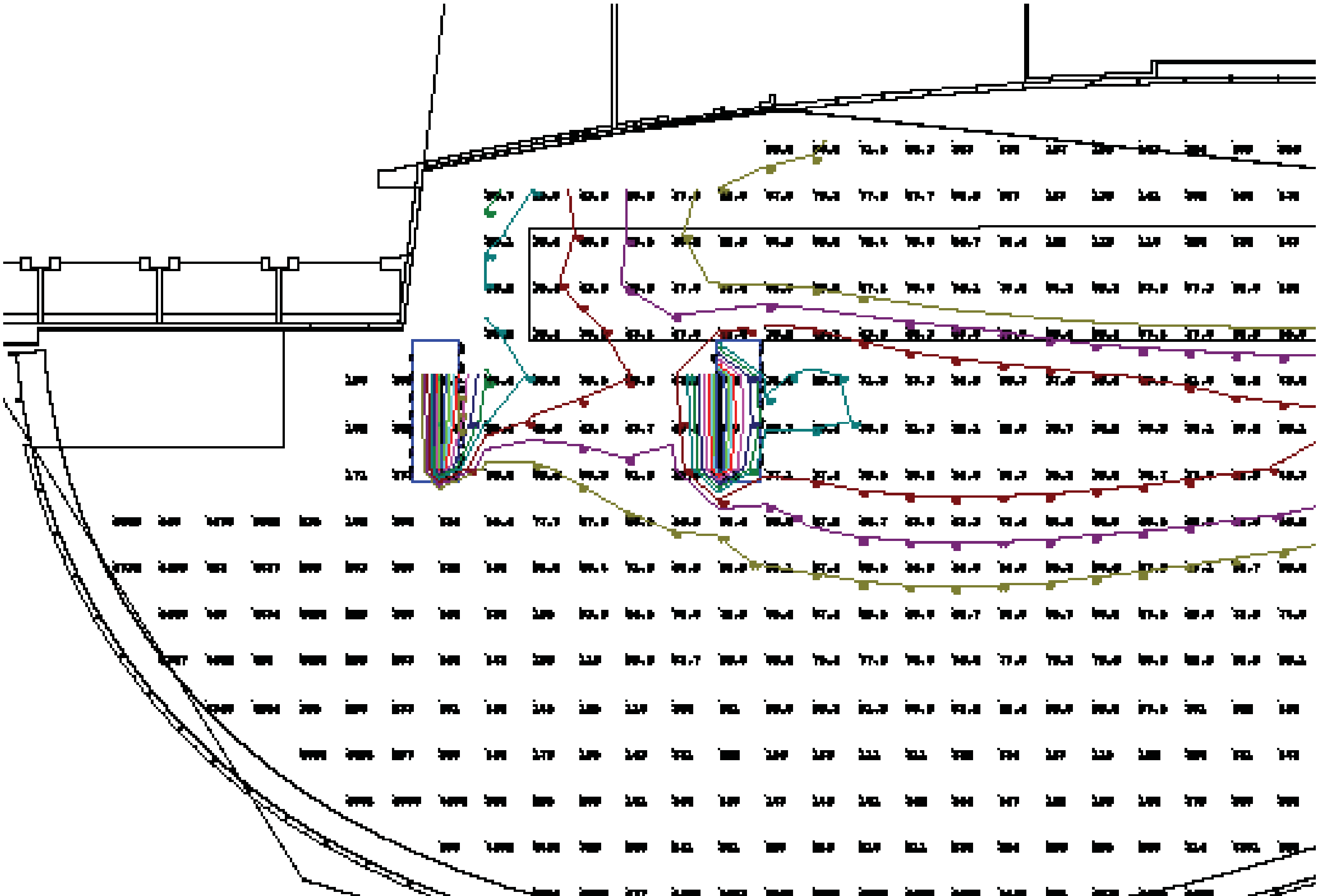


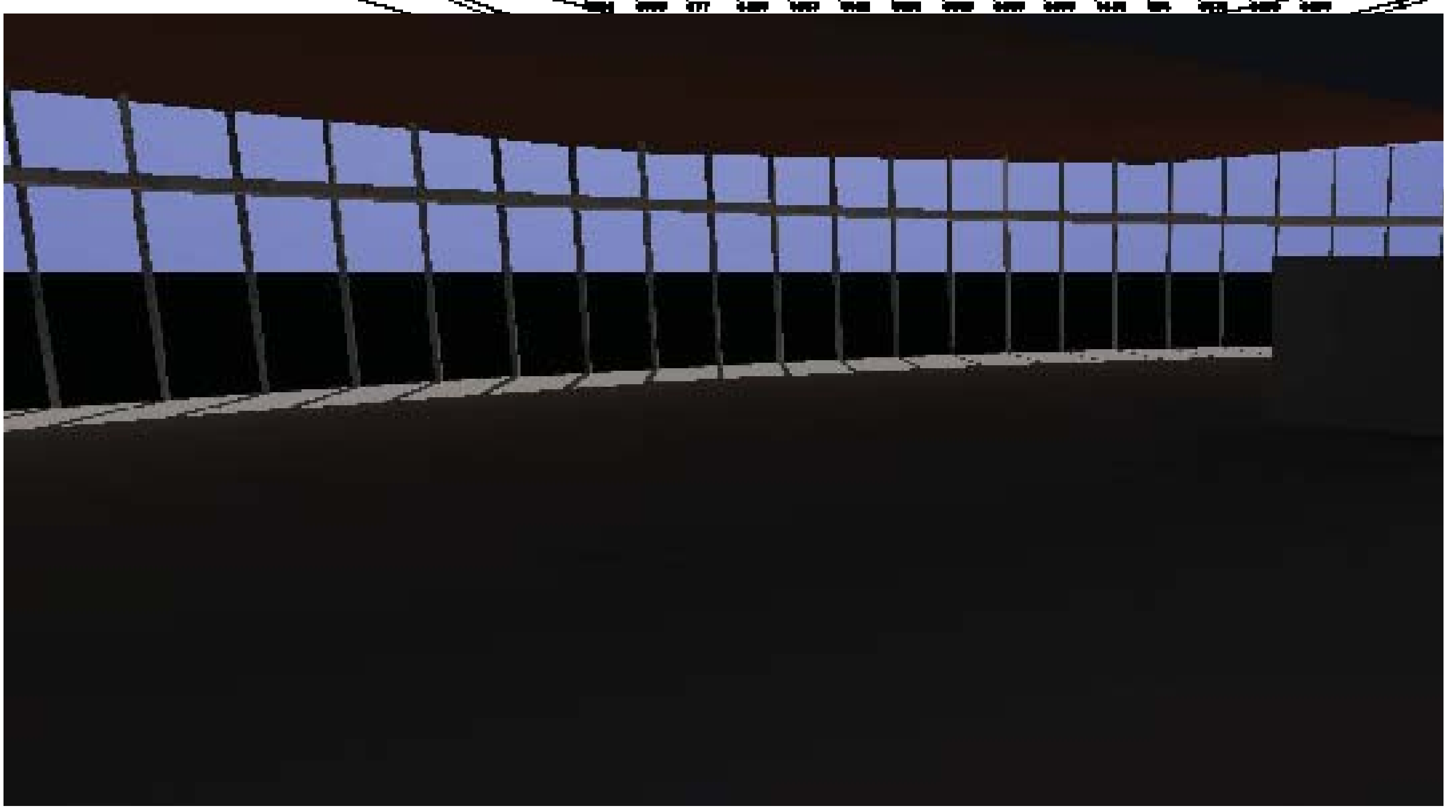
The same study was conducted for the stack area. Another daylight system was added to compare to the other light shelves, a fenestration control. This is to redirect the light but also to allow some direct sunlight through the shelf.





Interior Shelf 8:00am





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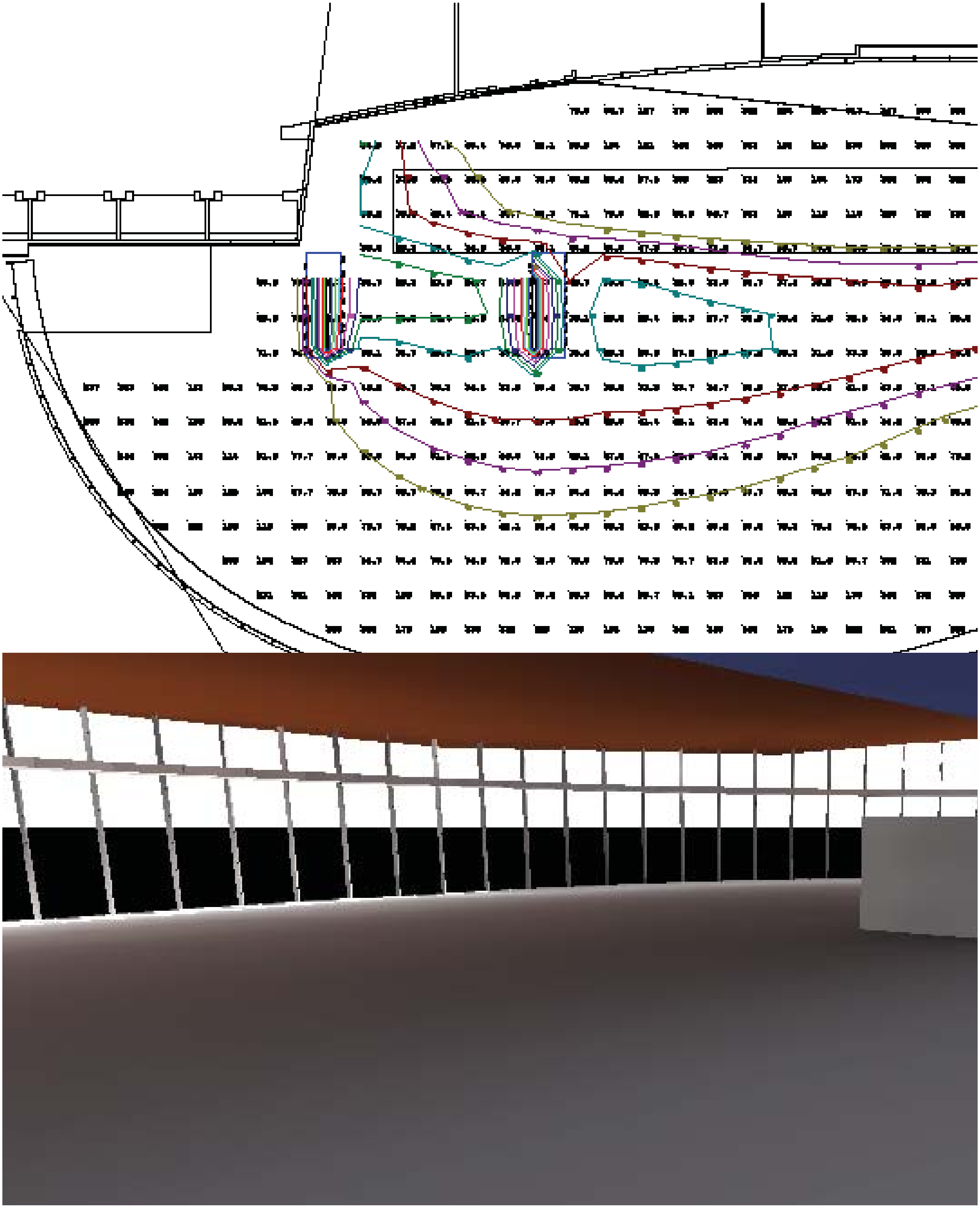

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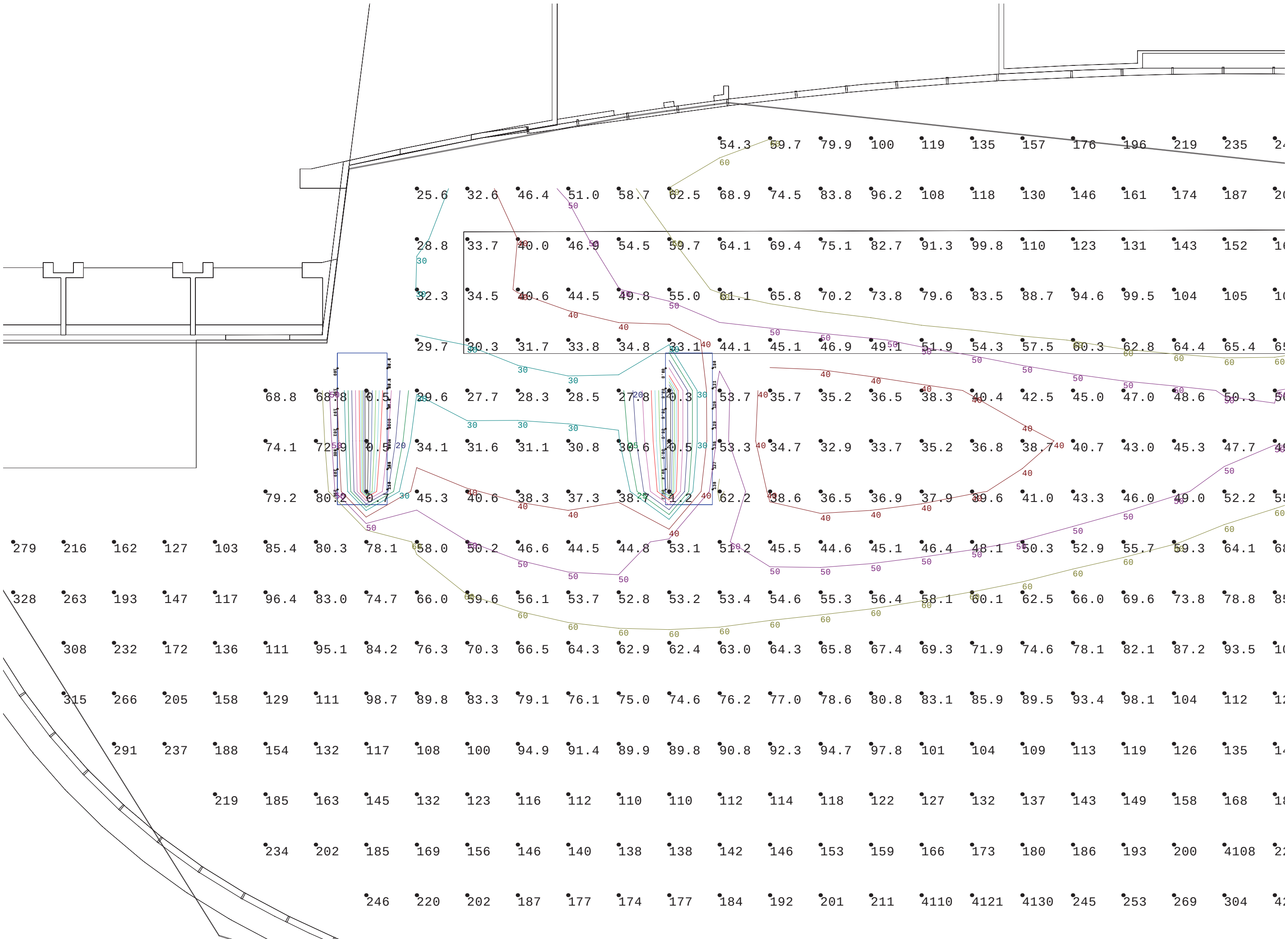
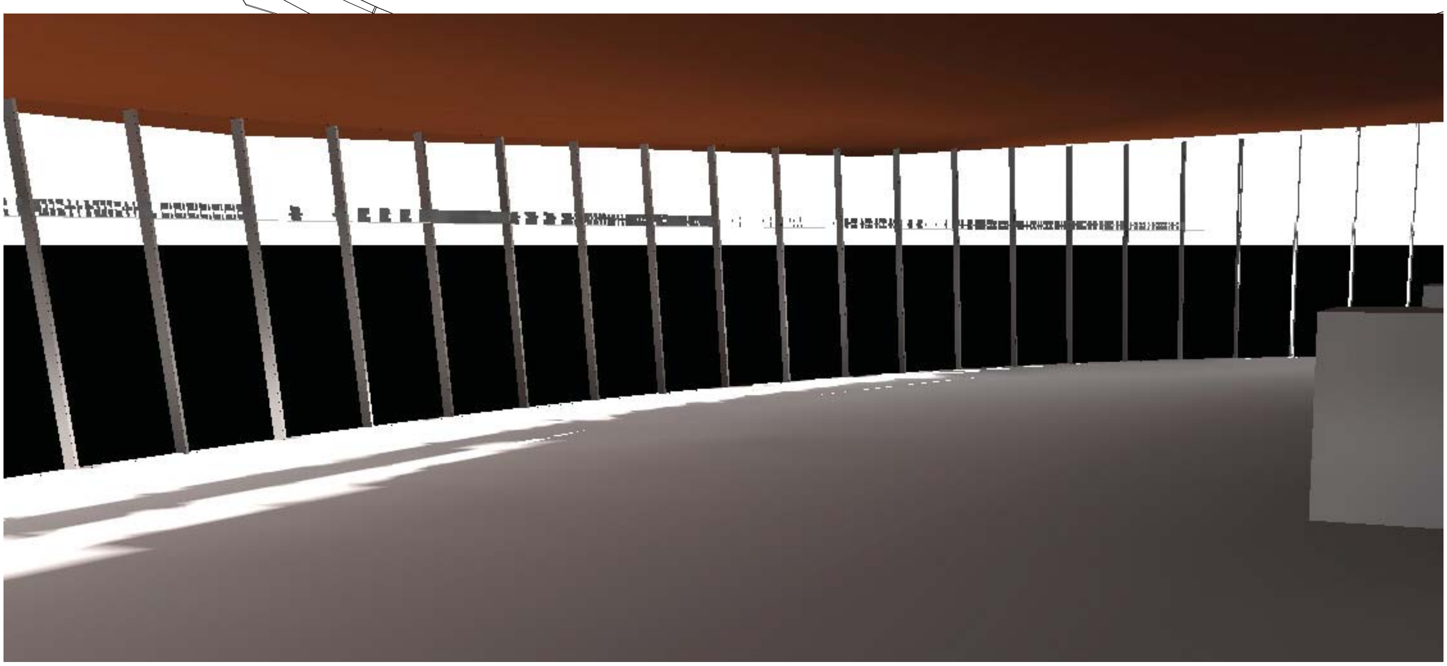
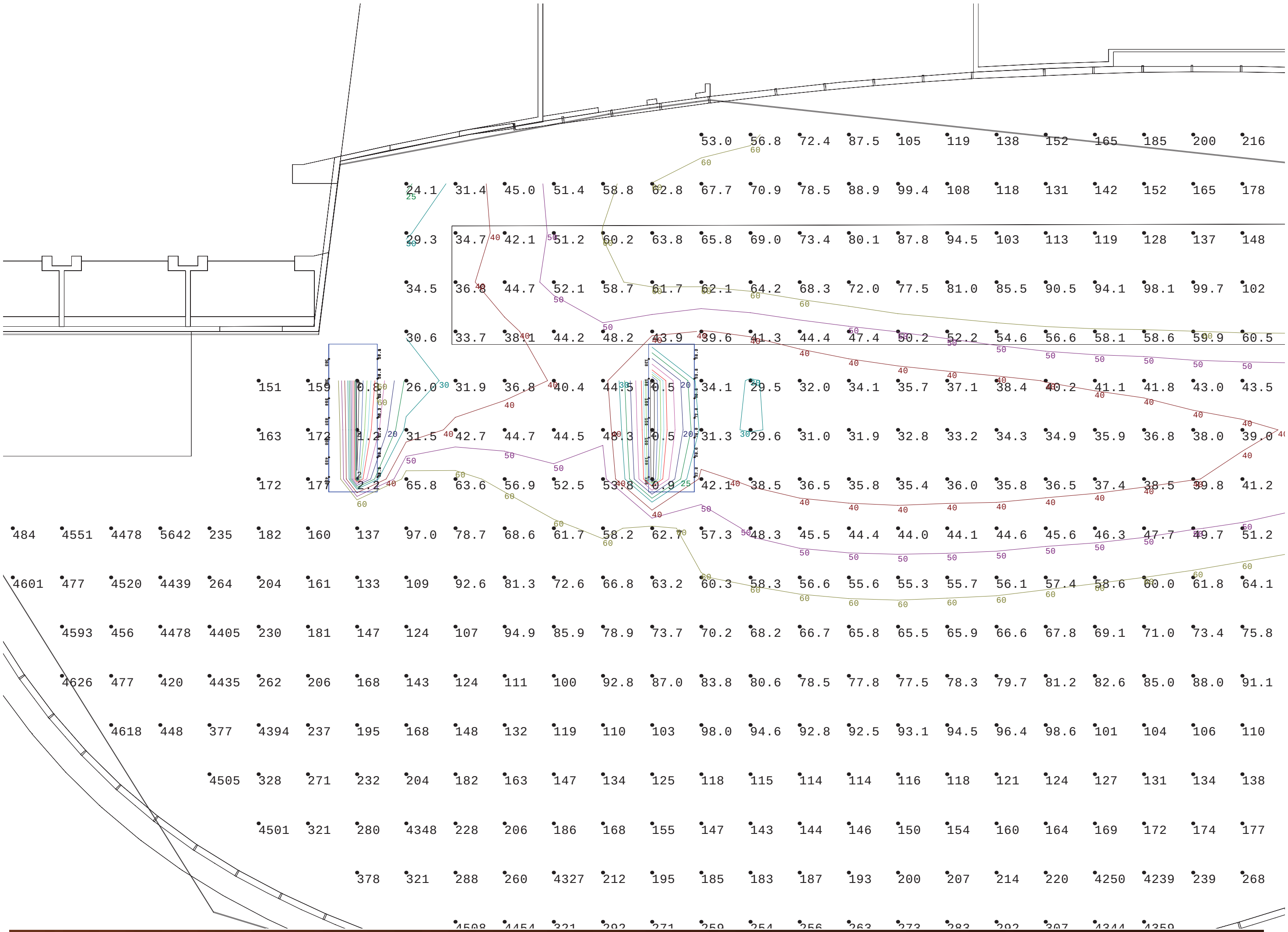




Exterior 8:00 am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34.5 36.8 44.7 52.1 58.7 61.7 62.1 64.2 68.3 72.0 77.5 81.0 85.5 90.5 94.1 98.1 99.7 102
30.6 33.7 38.1 44.2 48.2 43.9 39.6 41.3 44.4 47.4 50.2 52.2 54.6 56.6 58.1 58.6 59.9 60.5
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163 172 1.2 31.5 42.7 44.7 44.5 48.3 0.5 31.3 29.6 31.0 31.9 32.8 33.2 34.3 34.9 35.9 36.8 38.0 39.0
172 177 2.2 65.8 63.6 56.9 52.5 53.8 0.9 42.1 38.5 36.5 35.8 35.4 36.0 35.8 36.5 37.4 38.5 39.8 41.2
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4601 477 4520 4439 264 204 161 133 109 92.6 81.3 72.6 66.8 63.2 60.3 58.3 56.6 55.6 55.3 55.7 56.1 57.4 58.6 60.0 61.8 64.1
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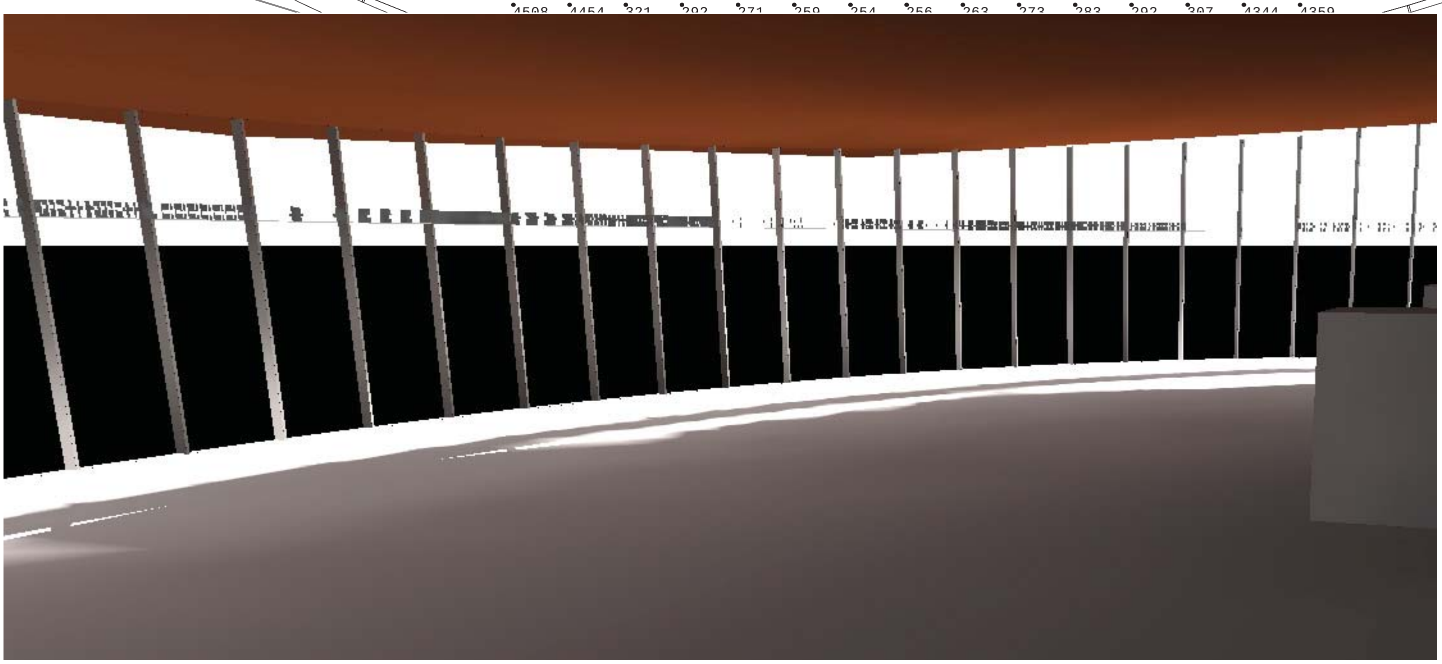

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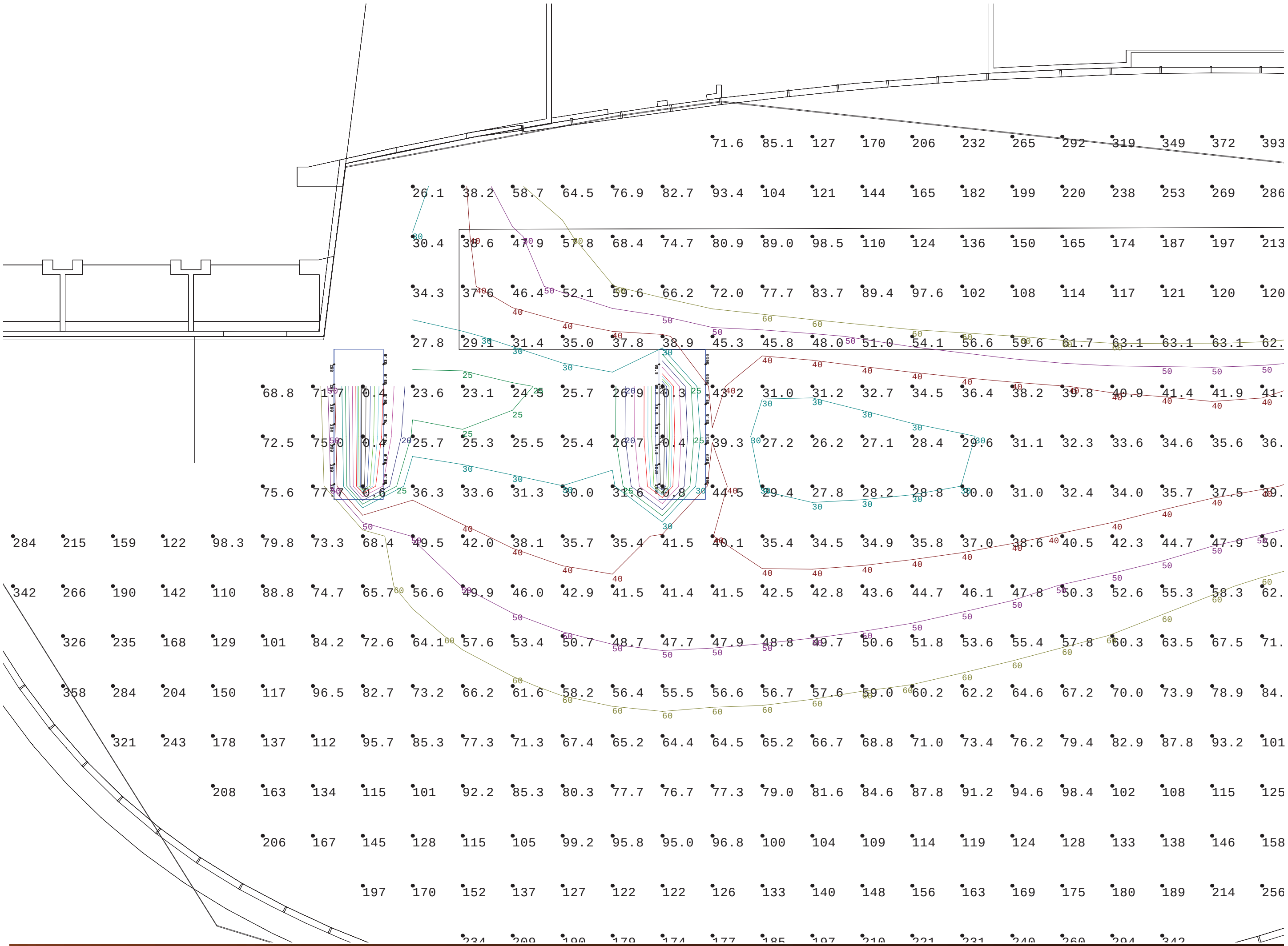
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34.3 37.6 46.4 52.1 59.6 66.2 72.0 77.7 83.7 89.4 97.6 102 108 114 117 121 120 120
27.8 29.1 31.4 35.0 37.8 38.9 45.3 45.8 48.0 51.0 54.1 56.6 59.6 61.7 63.1 63.1 63.1 62.
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284 215 159 122 98.3 79.8 73.3 68.4 49.5 42.0 38.1 35.7 35.4 41.5 40.1 35.4 34.5 34.9 35.8 37.0 38.6 40.5 42.3 44.7 47.9 50.
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326 235 168 129 101 84.2 72.6 64.1 57.6 53.4 50.7 48.7 47.7 47.9 48.8 49.7 50.6 51.8 53.6 55.4 57.8 60.3 63.5 67.5 71.
358 284 204 150 117 96.5 82.7 73.2 66.2 61.6 58.2 56.4 55.5 56.6 56.7 57.6 59.0 60.2 62.2 64.6 67.2 70.0 73.9 78.9 84.
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208 163 134 115 101 92.2 85.3 80.3 77.7 76.7 77.3 79.0 81.6 84.6 87.8 91.2 94.6 98.4 102 108 115 125
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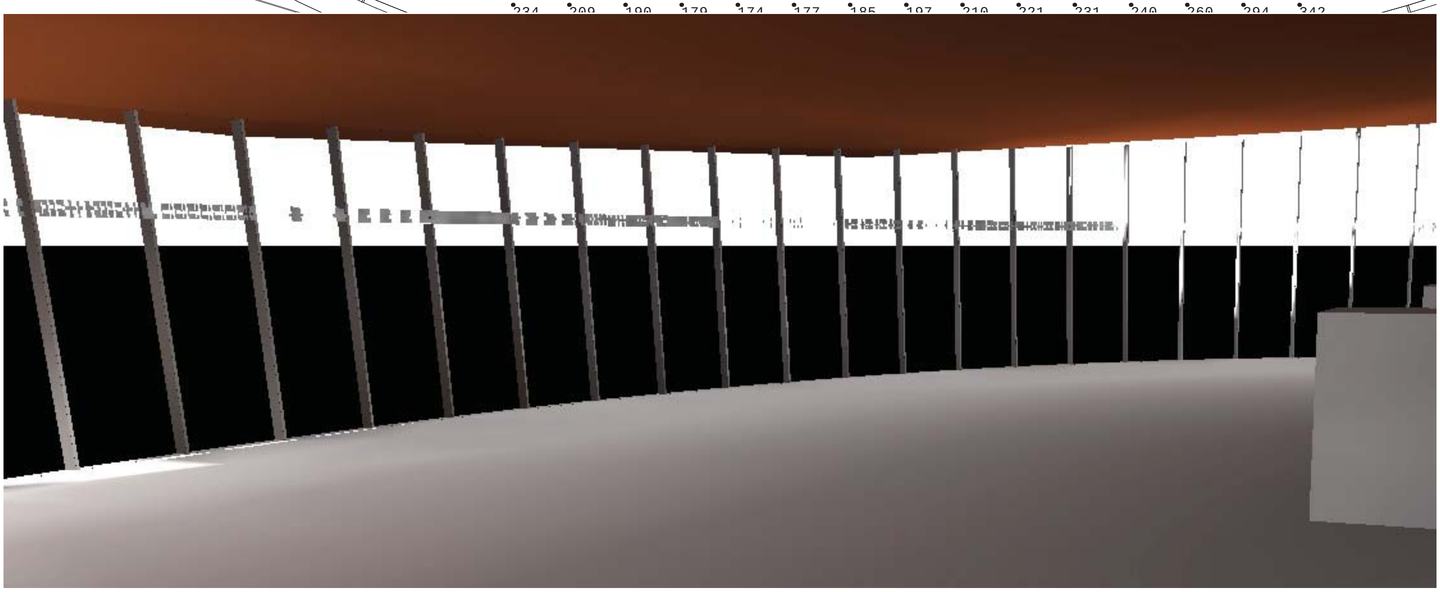

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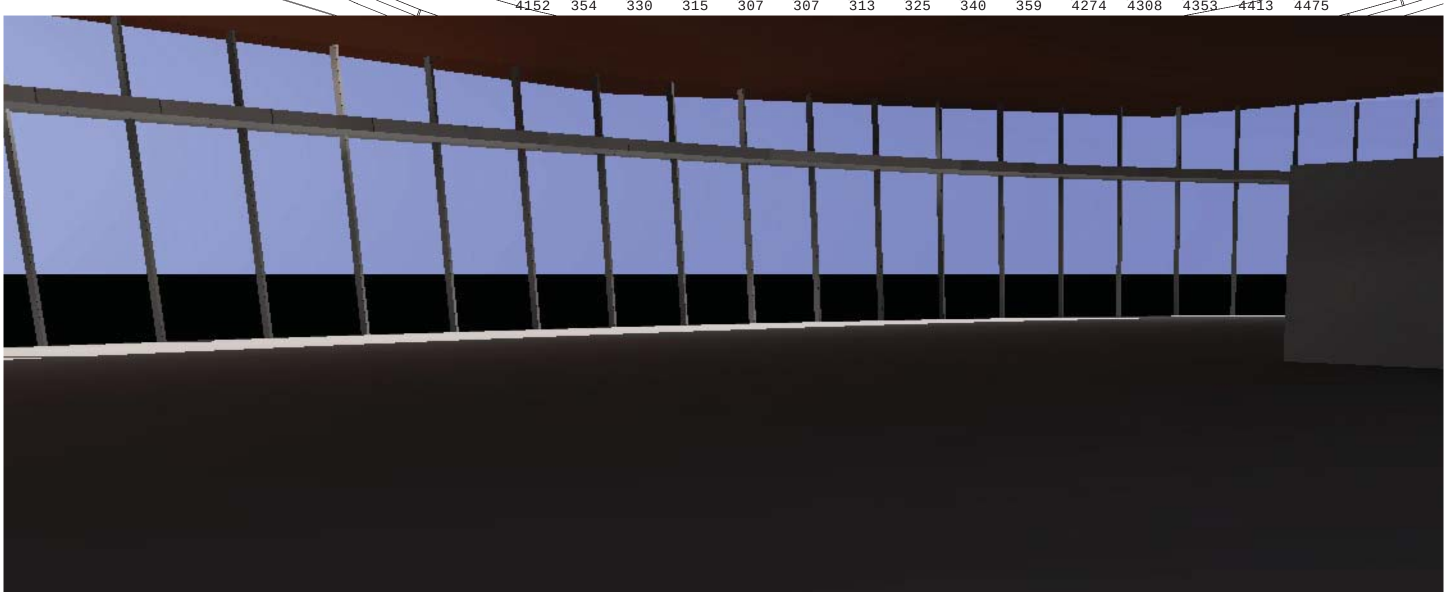
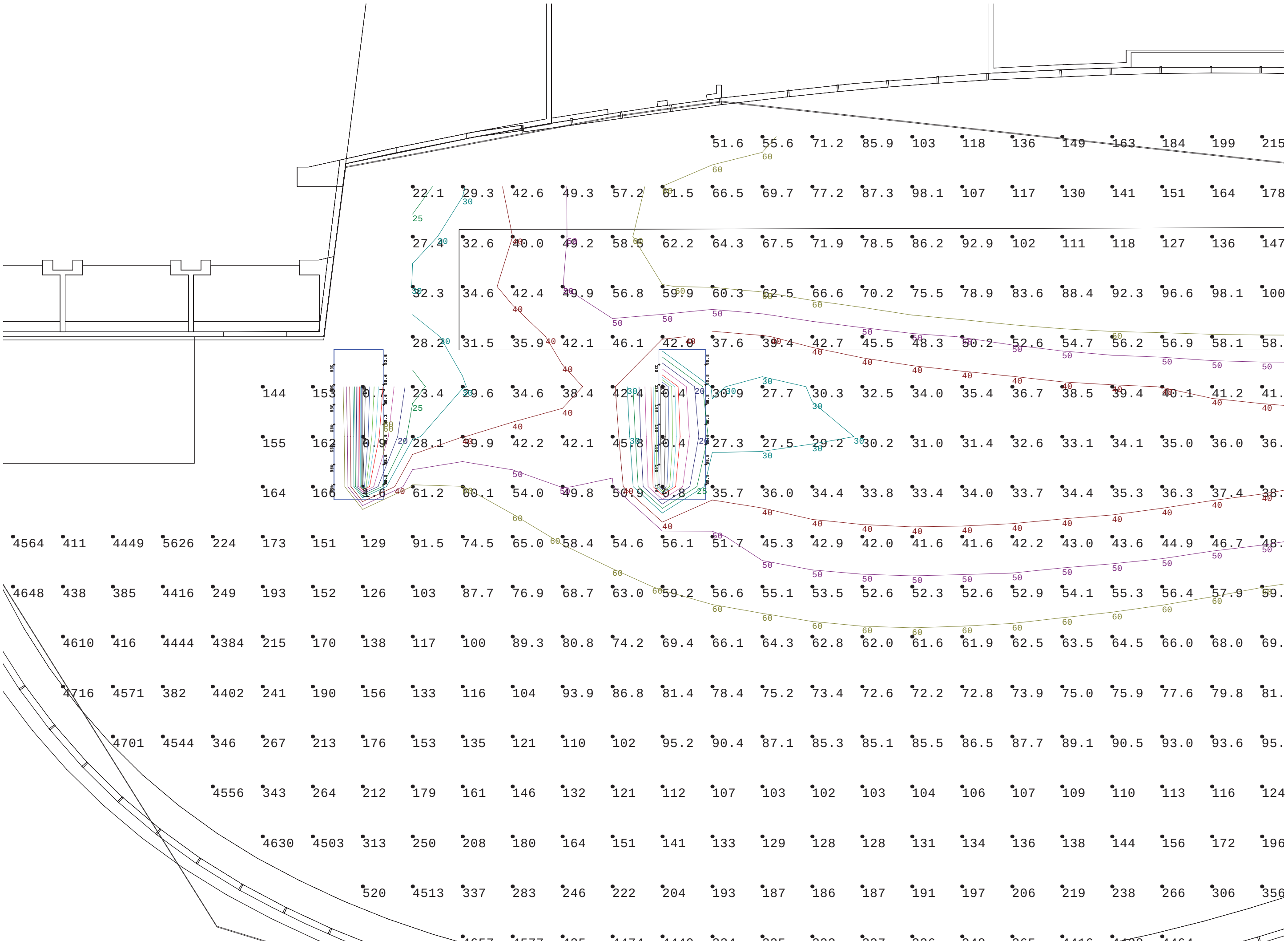


Interior and Exterior 8:00 am



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27.4 32.6 40.0 49.2 58.5 62.2 64.3 67.5 71.9 78.5 86.2 92.9 102 111 118 127 136 147
32.3 34.6 42.4 49.9 56.8 59.9 60.3 62.5 66.6 70.2 75.5 78.9 83.6 88.4 92.3 96.6 98.1 100
28.2 31.5 35.9 42.1 46.1 42.0 37.6 39.4 42.7 45.5 48.3 50.2 52.6 54.7 56.2 56.9 58.1 58.
144 153 0.7 23.4 29.6 34.6 38.4 42.4 0.4 30.9 27.7 30.3 32.5 34.0 35.4 36.7 38.5 39.4 40.1 41.2 41.
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164 166 1.6 61.2 60.1 54.0 49.8 50.9 0.8 35.7 36.0 34.4 33.8 33.4 34.0 33.7 34.4 35.3 36.3 37.4 38.
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4610 416 4444 4384 215 170 138 117 100 89.3 80.8 74.2 69.4 66.1 64.3 62.8 62.0 61.6 61.9 62.5 63.5 64.5 66.0 68.0 69.
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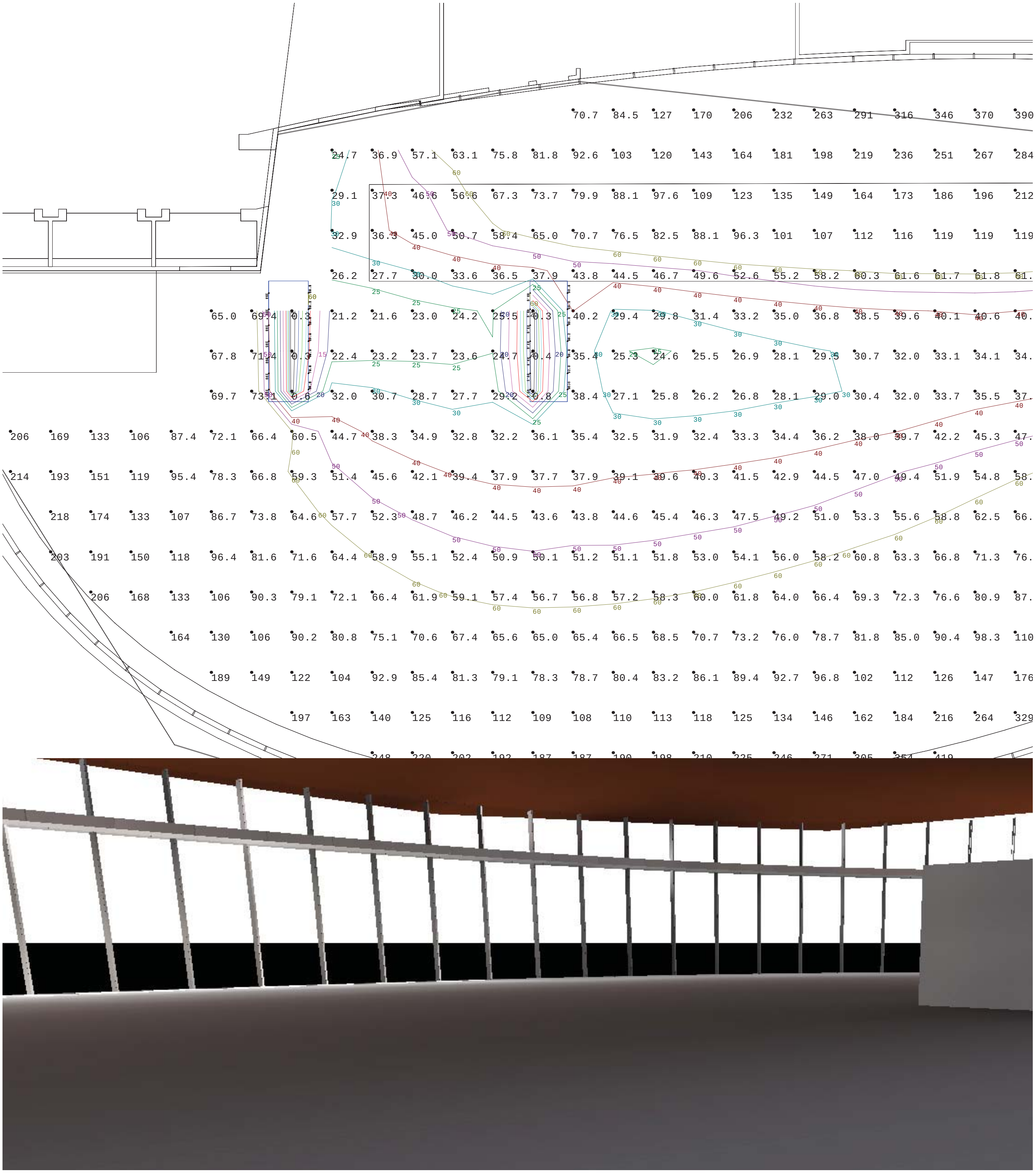
11:00 am



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67.8 71.4 0.3 22.4 23.2 23.7 23.6 24.7 0.4 35.4 25.3 24.6 25.5 26.9 28.1 29.5 30.7 32.0 33.1 34.1 34.
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206 169 133 106 87.4 72.1 66.4 60.5 44.7 38.3 34.9 32.8 32.2 36.1 35.4 32.5 31.9 32.4 33.3 34.4 36.2 38.0 39.7 42.2 45.3 47.
214 193 151 119 95.4 78.3 66.8 59.3 51.4 45.6 42.1 39.4 37.9 37.7 37.9 39.1 39.6 40.3 41.5 42.9 44.5 47.0 49.4 51.9 54.8 58.
218 174 133 107 86.7 73.8 64.6 57.7 52.3 48.7 46.2 44.5 43.6 43.8 44.6 45.4 46.3 47.5 49.2 51.0 53.3 55.6 58.8 62.5 66.
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206 168 133 106 90.3 79.1 72.1 66.4 61.9 59.1 57.4 56.7 56.8 57.2 58.3 60.0 61.8 64.0 66.4 69.3 72.3 76.6 80.9 87.
164 130 106 90.2 80.8 75.1 70.6 67.4 65.6 65.0 65.4 66.5 68.5 70.7 73.2 76.0 78.7 81.8 85.0 90.4 98.3 110
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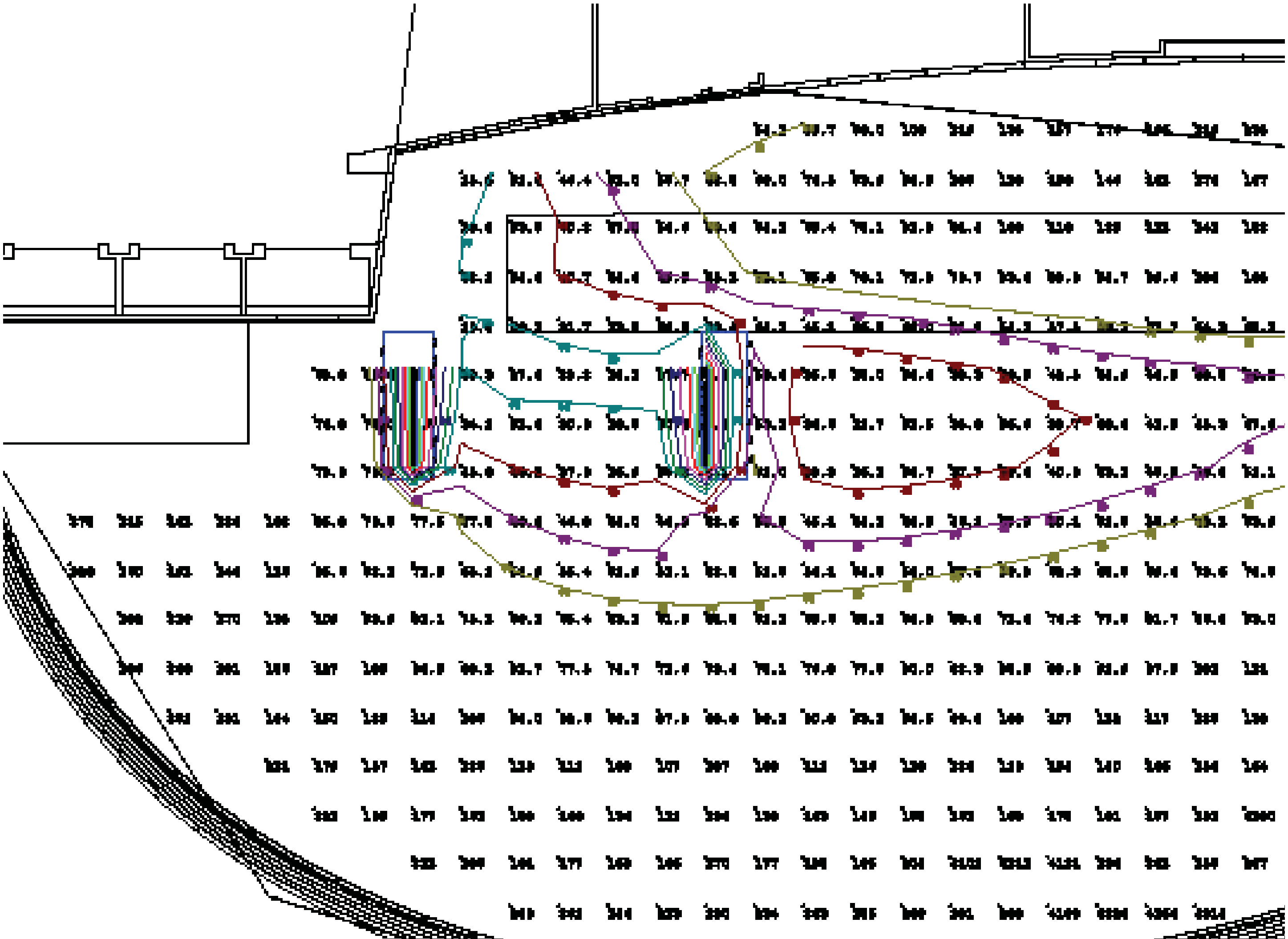
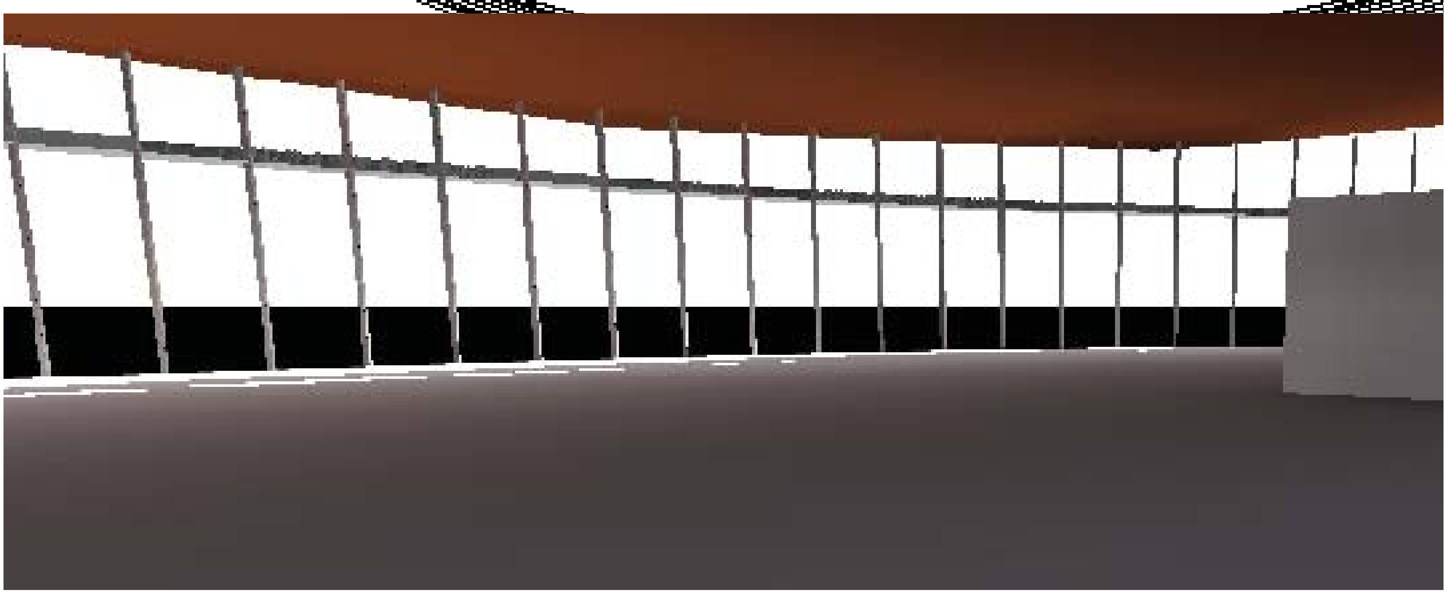
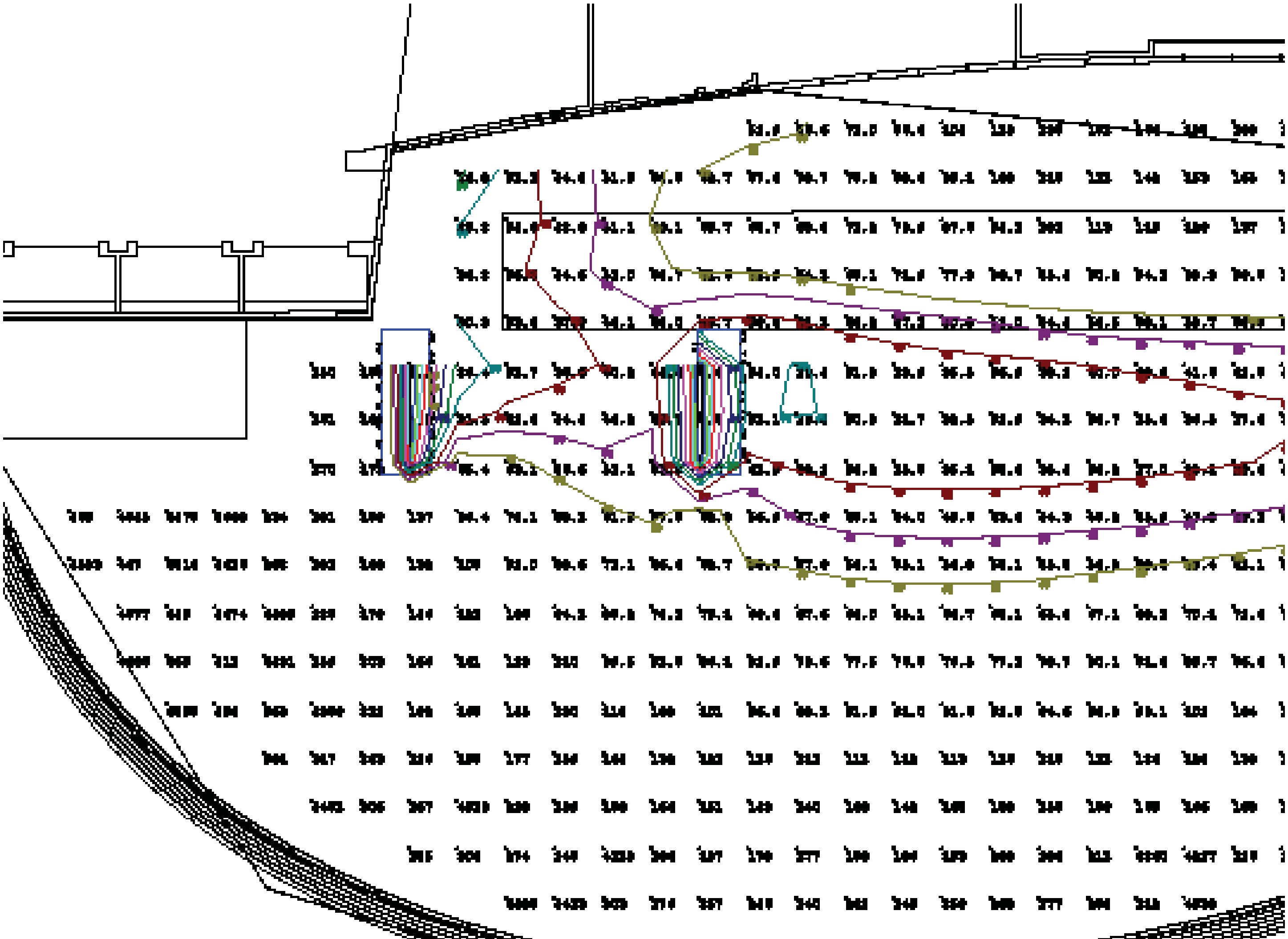
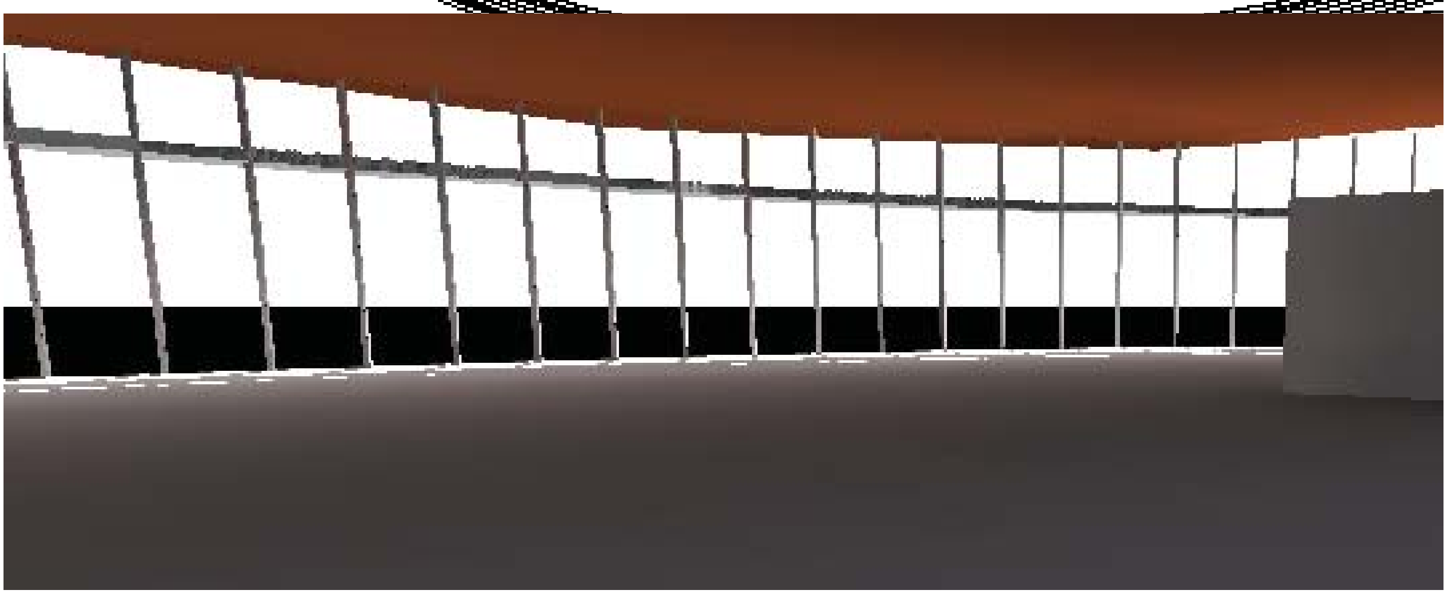
3:00 pm



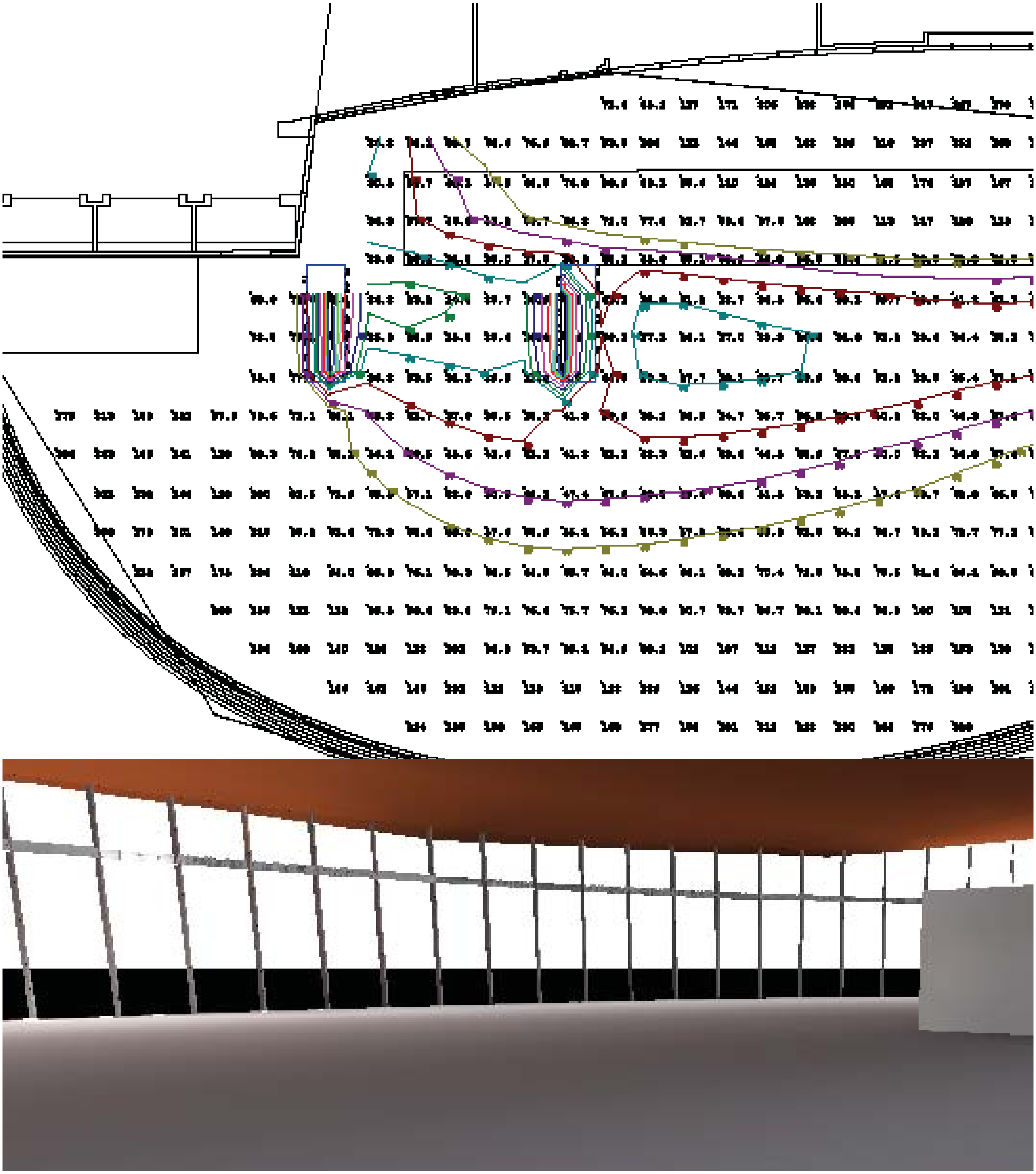


Fenestration Control 8:00 am





11:00 am



3:00 pm

The exterior light shelf brings the daylight the furthest into the space at all times of the day. Being able to get that much daylight into the space will cut down on energy costs due to the controls of the redesign. By adding more photocells the space will not need near the amount of electric lighting and can save energy throughout the year.

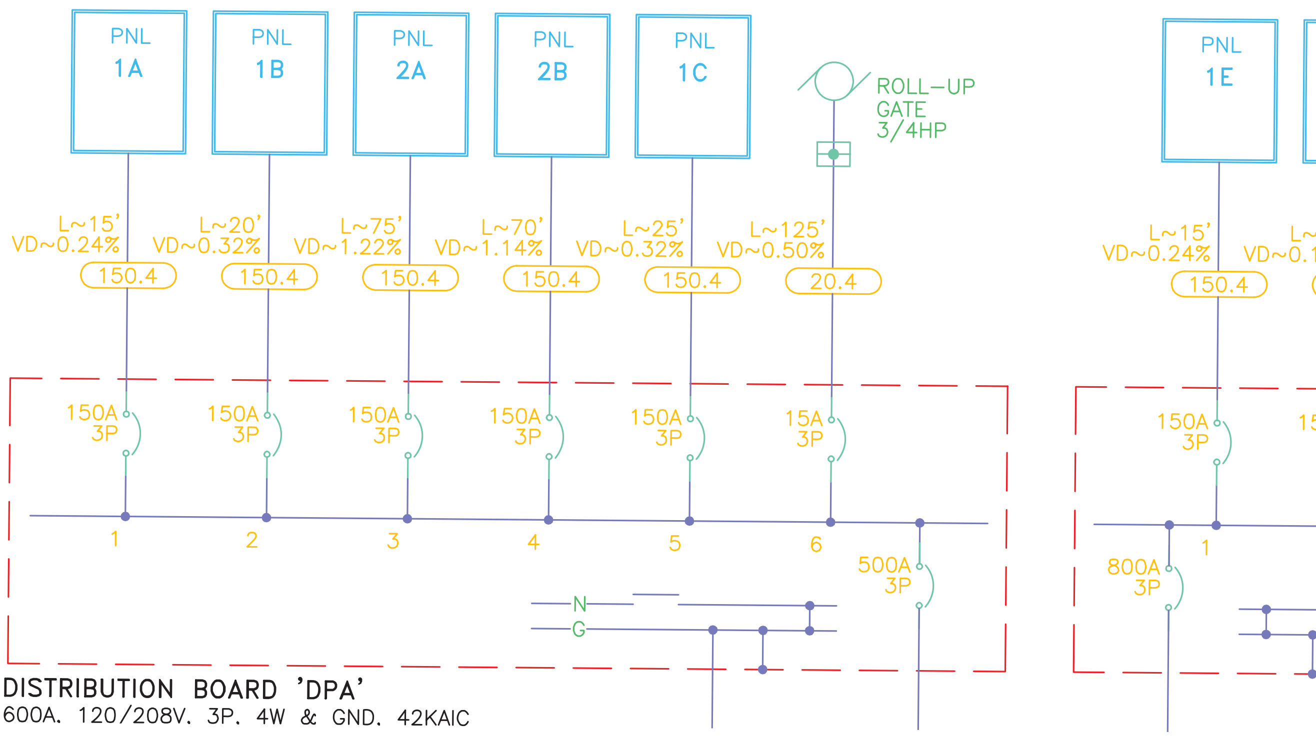
Electrical Depth

Introduction

Rio Hondo Library and Learning Resource Center is 93,740 square feet which borders on a project that might be too large for only one transformer, however, there are a small number of panelboards and the distribution panels are sized for a lot of future growth. This depth investigates combining the two transformers into one large transformer and the cost and the affect on the system. This also goes into a depth on a new control system for the lighting redesign.

Transformer Configurations

This building runs off two step-down transformers to provide power at both 277/480V and 120/208V. T-1 is rated at 150 KVA while T-2 is rated at 225 KVA. T-1 steps down the power for the first distribution panel running at 120/208V that services panels 1A, 1B, 2A, 2B, 1C, and the roll up gate that is running at ¾ HP. T-2 steps down the power for the second distribution panel running at 120/208V that services panels 1E, 1D, 2C, 2D, 1F, 2E, and 1G. Two sets of 2.50” conduit with conductors sized at (4) phase, 250 KCMIL and a #2 sized ground wire carries the power that runs from T-1 to the distribution board while three sets of 3.00” conduit with conductors sized at (4) phase, 300 KCMIL and a #1/0 sized ground wire carries the power that runs from T-2 to its distribution board. The single line diagram can be found in the appendix.



	Main Distribution Panel DSA		KVA					
Poles	BKR	Service	Total	A	B	C		
3	150	Panel 1A		7.74	8.28	7.3		
3	150	Panel 1B		10.44	9.54	8.46		
3	150	Panel 2A		10.5	10.72	9.18		
3	150	Panel 2B		9.44	8.57	10.99		
3	150	Panel 1C		7.5	7.5	7.58		
3	150	Roll Up Door		0.38	0.38	0.38		
		Space		0				
		Space			0			
		Space				0		
		Space		0				
		Space			0			
		Space				0		
		Space		0				
		Space			0			
		Connected load per phase		46	44.99	43.89		
		Load Summary		Conn. KVA	Deman Factor	Demand KVA		
		Type "L" Continuous Loads		0	1.25	0		
		Type "R" Receptacles (First 10KVA)		10	1	10		
		Type "R" Receptacles (Over 10 KVA)		107.84	0.5	53.92		
		Type "M" Miscellaneous Loads		9.25	1	9.25		
		Type "A" AC Loads		7.8	1	7.8		
		Type "K" Kitchen Loads			0.65			
			Largest Motor Load		0.25			
			Total	134.88		80.97		
							Amps	Size
							224.7568	600 A

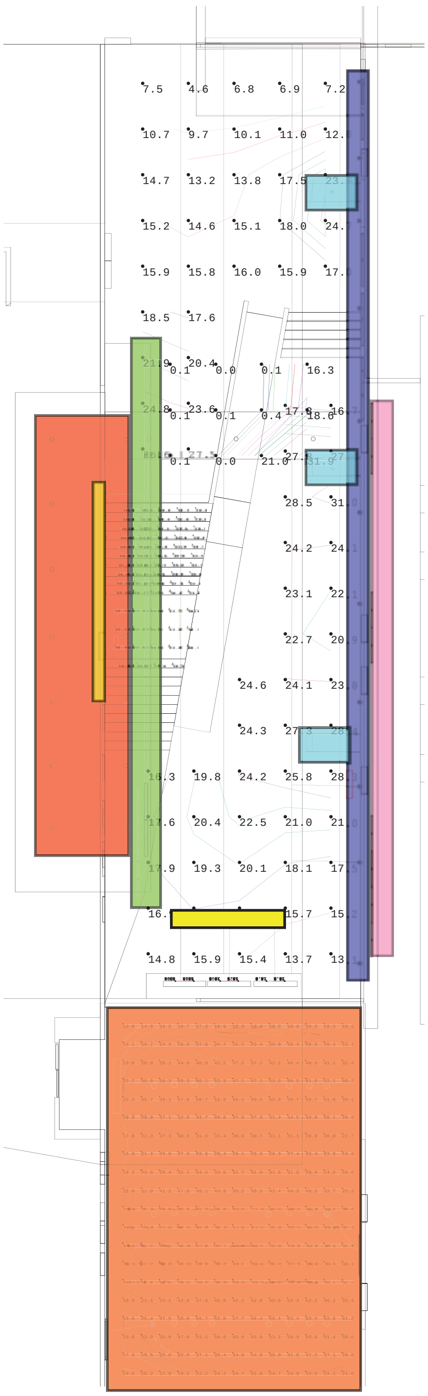
	Main Distribution Panel DSA		KVA					
Poles	BKR	Service	Total	A	B	C		
3	150	Panel 1E		13.04	11.56	11.66		
3	150	Panel 1D		11.32	11.7	10.26		
3	150	Panel 2C		14.3	12.52	12.34		
3	150	Panel 2D		6.84	5.94	4.86		
3	150	Panel 1F		10.97	9.18	9.86		
3	150	Panel 2E		12.77	10.67	15.17		
		Panel 1G		10.32	9.12	8.14		
		Space			0			
		Space				0		
		Space		0				
		Space			0			
		Space				0		
		Space		0				
		Space			0			
		Connected load per phase		79.56	70.69	72.29		
		Load Summary		Conn. KVA	Deman Factor	Demand KVA		
		Type "L" Continuous Loads		0	1.25	0		
		Type "R" Receptacles (First 10KVA)		10	1	10		
		Type "R" Receptacles (Over 10 KVA)		143.28	0.5	71.64		
		Type "M" Miscellaneous Loads		38.48	1	38.48		
		Type "A" AC Loads		30.78	1	30.78		
		Type "K" Kitchen Loads			0.65			
			Largest Motor Load		0.25			
			Total	222.54		150.9		
							Amps	Size
							418.8688	800A

	Main Distribution Panel DSA							
Poles	BKR	Service	Total	A	B	C		
3	150	Panel 1A		7.74	8.28	7.3		
3	150	Panel 1B		10.44	9.54	8.46		
3	150	Panel 2A		10.5	10.72	9.18		
3	150	Panel 2B		9.44	8.57	10.99		
3	150	Panel 1C		7.5	7.5	7.58		
3	150	Roll Up Door		0.38	0.38	0.38		
3	150	Panel 1E		13.04	11.56	11.66		
3	150	Panel 1D		11.32	11.7	10.26		
3	150	Panel 2C		14.3	12.52	12.34		
3	150	Panel 2D		6.84	5.94	4.86		
3	150	Panel 1F		10.97	9.18	9.86		
3	150	Panel 2E		12.77	10.67	15.17		
3	150	Panel 1G		10.32	9.12	8.14		
		Space		0				
		Connected load per phase		125.56	115.68	116.18		
		Load Summary		Conn. KVA	Deman Factor	Demand KVA		
		Type "L" Continuous Loads		0	1.25	0		
		Type "R" Receptacles (First 10KVA)		10	1	10		
		Type "R" Receptacles (Over 10 KVA)		251.12	0.5	125.56		
		Type "M" Miscellaneous Loads		47.73	1	47.73		
		Type "A" AC Loads		38.58	1	38.58		
		Type "K" Kitchen Loads			0.65			
			Largest Motor Load		0.25			
			Total	347.43		221.87		
							Amps	Size
							615.8676	1231.735

The new single distribution panel would be sized at 1200A which would allow for ample growth of the system. The new wire size for this distribution panel would be 3P, 4W and GND, 100KAIC.
Below is a chart of a cost comparison of the two systems:

	Transformer	Cost	Circuit Breaker	Cost	Distribution Panel	Cost	Fuse Size	Cost	Total
New System	500 KVA	20783	1200A	106	1200 A	2450	1200	300	23639
Old System	150 KVA + 225 KVA	15488	500 A + 800 A	212	600 A + 800 A	4542		50	20292

Another part of the electrical depth is the new control system for the redesign of the lighting system. Since the library is open for the majority of daylit hours for sunny California the necessity for a fully dimmable system is absolute. With all glass facades on the larger group areas choosing to zone luminaires by location of daylight coming into the space seemed obvious. With the new lighting control system by Super Dim, luminaires will be able to be dimmed by the amount of daylight entering the space. Photocells will receive the light and dim the assigned luminaires. It provides architectural dimming levels: 1% for T5 and T5HO, and 3% for Compact Fluorescents. See below for controls.



Lighting Zones
Green
Yellow
Red
Purple In columns - sky blue
Orange
Yellow
Green

The first pink lighting zone is the linear wallwash fixture F04. These are zoned together because they all serve the same purpose in the same location. During the day hours these lights have the potential to be dimmed down to as much as 1% with the daylight entering the space through the skylight.

The navy lighting zone is the recessed adjustable F17 that is located in the wall above the second floor. These are zoned and circuited together due to the fact their purpose is to light the ceiling and they run parallel to the skylight. So for most hours of the day these can be dimmed due to the fact that the skylight will be naturally highlighting the ceiling.

The next lighting zone moving away from the skylight are more of the recessed adjustable F17 fixtures. These are zoned together because their photocell will be located closer to the ground level because they are the primary source of light for the walkway.

The green lighting zone are all the cove light F05 fixtures and also the linear wallwash that is located below the stairwell. These luminaires have the ability to be dimmed but will mostly be staying at output to create a uniform lighting effect with all the daylight spilling in from the skylight located on the opposite side of the angled ceiling.

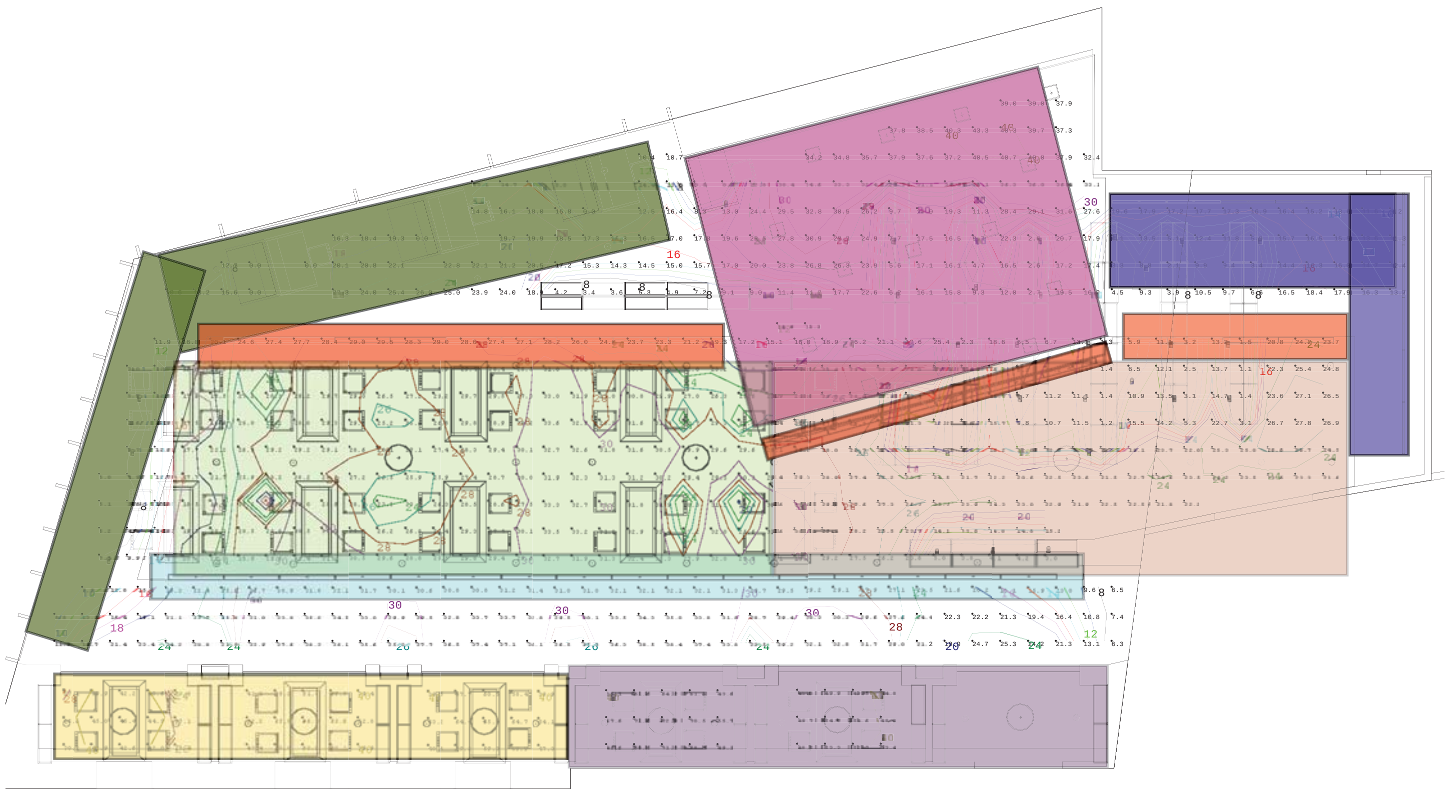
Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F08	Fluorescent	Recessed Step Light	"Heli" series,	20w	(1) T9	85	3500
F10	Fluorescent	Recessed 6" Downlight	5-11/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	42w	(1) TT	82	3500
F17	Halogen	Recessed Adjustable Light	"Grid in Limit" series, includes Reflector FL-20 degrees and Glass UV Q Top	50w	(2) 50w	82	3000
F21	Halogen	Juno Track Light	"Classic" series	50w	(1) 50w MR16	100	3050
F22	Halogen	Recessed Floor luminaire	Erco "Nadir" series, 30 degree angle	75w	(1) PAR 30	81	2830
F04	Fluorescent	Recessed 1x4 Wallwash Troffer	"Avenue A" series	28w	(1) 28w T5	82	3500

The red lighting zone are the downlights, F10, located in the floating ceiling . Staying at output for the majority to achieve the correct light level on the stairwell and corridor.

The orange lighting zone is the gallery space where the track lighting is located. The track has the ability to turn on/off fixtures that do not need to be used conserving energy.

The last lighting zone is the yellow lighting zone. This zone consists of the step light from Deltalight and the recessed floor uplights from Erco. These luminaires will not be dimmed due to the importance. The uplights highlight the main focal point in the space and the step lights highlight the main stairwell for the entire library.

Photocells will be located along the ceiling for the blue zone and near the walkway for the sky blue zone. The pink and green zones will have cells near the walls they are highlighting.



Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
F04	Fluorescent	Recessed 1x4 Wallwash Troffer	"Avenue A" series	28w	(1) 28w T5	82	3500
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F10	Fluorescent	Recessed 6" Downlight	5-11/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	32w	(1) TT	82	3500
F12	Fluorescent	Recessed 6" WallWash	"Haze" Alzak reflector	32w	(1) TT	82	3500
F18	Fluorescent	Indirect Pendant	"Metro" series, low profile round housing 11" diameter luminous acrylic diffuser	42w	(4) TT	82	3500
F23	Fluorescent	Recessed 2'x2' Square	"Sky" series, Bi directional	14w	(4) 14w T5	82	3500

The first lighting zone is the dark green that follows the perimeter of the glass facade. These are zoned to have ability to be fully dimmed to the 3% when the daylight is at its full peak in the space.

Following along the perimeter the yellow zone is circuited and grouped together because of the large windows in the small space. The ability to dim these should also be addressed for enery conservation.

The purple zone consisting of the 6” wallwash F12 and the Metro pendant, F18, will have to stay at high output because this area gets the least amount of bounce from the daylight entering the space. This area is also a work area so to achieve a minimum of 30 fc is a requirement.

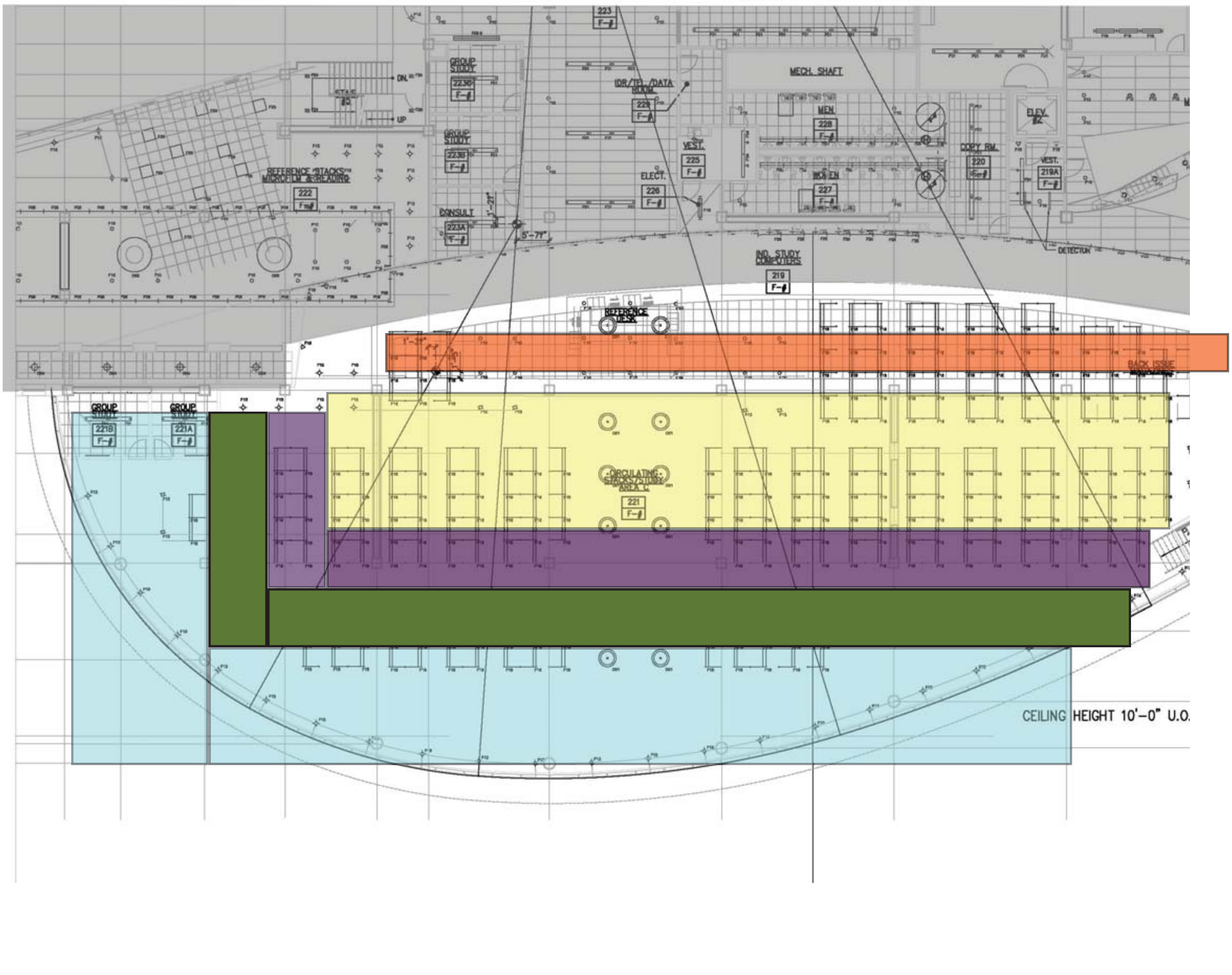
The blue zone of F04, cove lights are separated from the other side because even if the opposite side is receiving enough daylight the other side must be tested because of the main walkway through the space.

The green and pink area is zoned separately because in most of the studies the daylight was easily reached the middle of the space but at certain times is when it began to drop off further in the space. If they are on separate circuits than the dimmability will still pay off.

The magenta zone is comprised of the Sky, F23 fixture. This zone will remain at full output because of location of the stacks.

The red zone, will have the ability to be dimmed while the daylight is sufficient to light the space alone.

The dark blue zone, will remain at full output. This zone is kept at full output because it is washing the wall and keeping the cavelike feeling out of this small stack area. These linear wallwashers will remain a highlight point.


GROUP STUDY
223C
CONSULT
223A
REFERENCE STACKS MICROFILM & READING
222
IDR/TEL/DATA ROOM
229
MECH. SHAFT
MEN
228
WOMEN
227
VEST.
225
ELECT.
226
COPY RM.
220
VEST.
219A
ELEV.
IND. STUDY COMPUTERS
219
REFERENCE DESK
BACK ISSUE
GROUP STUDY
221B
221A
CIRCULATING STACKS/STUDY AREA C
221
CEILING HEIGHT 10'-0" U.O.

Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
D01	Fluorescent	Decorative Pendant - 3'	"Club C" series, Deltalight, Halospot 111, Alu-reflektor	75w	(4) 75w	82	3500
F10	Fluorescent	Recessed 6" Downlight	5-11/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	42w	(1) 42w TT	82	3500
F13	Compact Fluorescent	Surface Mounted Cylinder - 6"	Medium beam distribution, haze Alzak reflector	42w	(1) 42w TT	82	3500
F14	Fluorescent	Stack Light		54w	(2) 54w T5HO	85	3500
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F04	Fluorescent	Recessed 1x4 Wallwash Troffer	"Avenue A" series	28w	(1) 28wT5	82	3500

The blue zone that contains the surface mounted cylinders, F13, that follow the perimeter of the glass facade are zoned together.

As you go back further into the area the zones start following the shape of the building. Each area contains the stack lights. The now indirect/direct fixture from Focal Point, F10. Keeping zones that follow the shape of day-light will allows the most energy conservation.

The red zone are the downlights, F10, that are recessed into the floating ceiling. These will remain at full output due to the workplane underneath.

Construction Management Breadth

Introduction

To determine whether the redesign of the electrical system would be an improvement a cost analysis had to occur. It comes down to money for many redesigns and for the new electrical system it was close.

In comparing systems only the new equipment for the combination was considered

As seen in the electrical section the cost of combining distribution panels and upgrading to a larger transformer does not pay off in the end. The new redesigned system cost is $23639 compared to $20292. The cost of the larger equipment exceeds the cost of the combined smaller transformers by close to $5000. The larger equipment was harder to find prices for because it is not as common as a transformer rated at 150 KVA compared to the larger 500 KVA.

The table below shows a summary of the cost analysis that was performed. Costs were taken from GE and is attached in the appendix.

	Transformer	Cost	Circuit Breaker	Cost	Distribution Panel	Cost	Fuse Size	Cost	Total
New System	500 KVA	20783	1200A	106	1200 A	2450	1200	300	23639
Old System	150 KVA + 225 KVA	15488	500 A + 800 A	212	600 A + 800 A	4542	500+800	50	20292

Mechanical Breadth

Introduction

An additional investigation must occur into the effects on the heating and cooling loads from the redesigned electrical and lighting systems. The mechanical breadth work will evaluate these effects on the system.

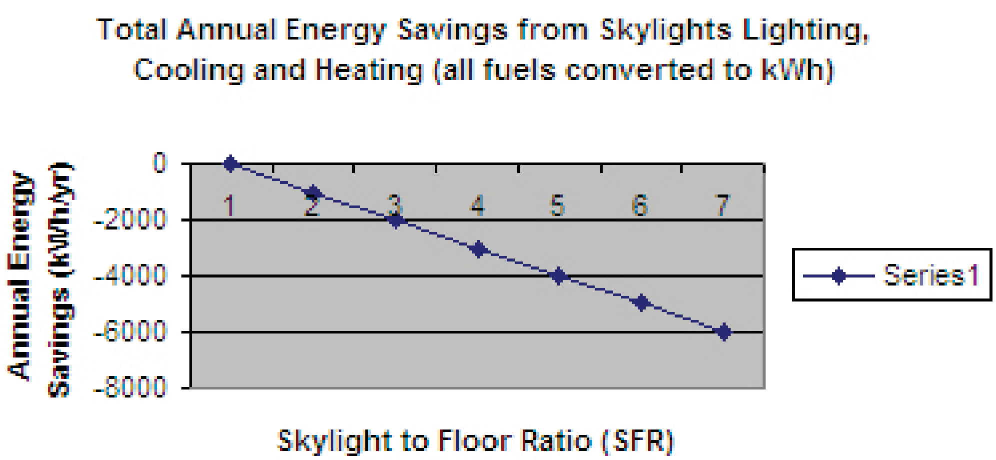
Important design factors of a good daylighting system are not only the controls and actual design of the system, but also load minimization. This Mechanical Breadth will study the different types of glazing for the windows to determine if they are the best solution for the daylighting system.

The glass in the library and learning center is Solarban 60 Solar Control Low-E glass made by PPG. Using Solarban 60 windows supposedly is “designed to provide solar control, while continuing to offer the traditional insulating performance and aesthetic benefits of low emissivity coated glass” (www.ppg.com).

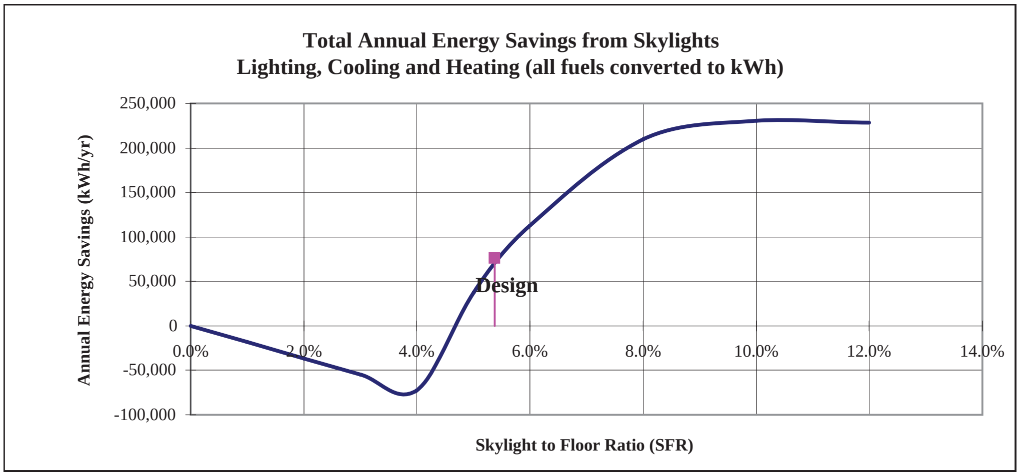
In the lobby, the skylight runs the length of the space. The advantage of the daylight in this area is much less than compared to the other spaces. This skylight could prove to be more of a problem than an asset. Skylights create unwanted heat gain and heat loss. This breadth work will determine if the skylight proves to be a good choice.

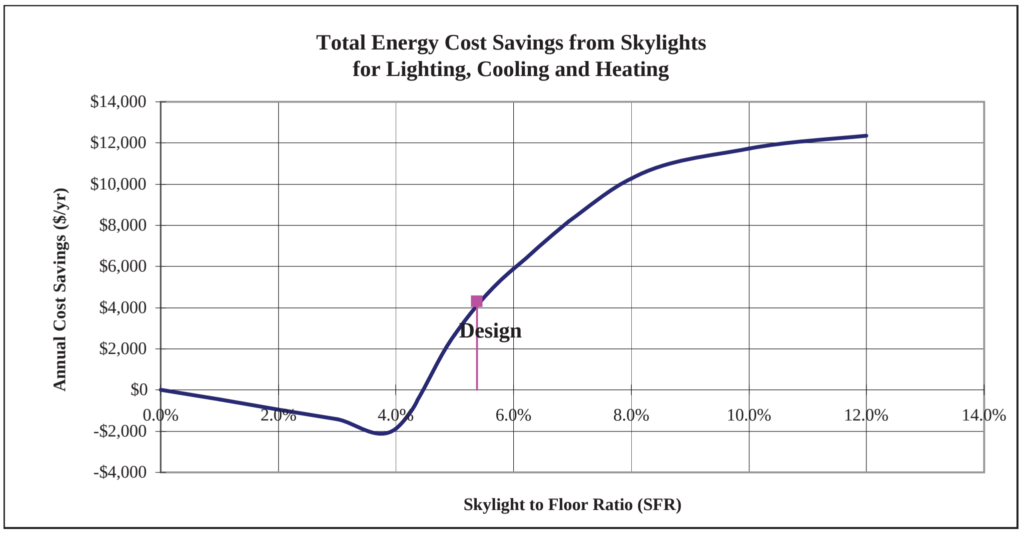
Existing Conditions

Performance Properties	Monolithic Clear Glass	Clear Glass and Solarban 60 (2) Glass 1G Unit
Ultraviolet Light Transmittance	77%	16%
Visible Light Transmittance	90%	72%
Insulating Properties Winter Night U-Value Winter Night R-Value BTU/(hr*sqft*degreeF)	1.12,0.88	0.3,3.33
Shading Coefficient	1.01	0.45
Indoor Glass Temperature	16.5degrees	54.5degrees
SHGC	0.75	0.39



The skylight dimensions are 4’ x 104’5-1/16”. The actual lobby dimensions are 28’-2” x 105’-4-1/2”. Sky calc is a simple program that calculates if the skylight in the lobby will pay off in energy savings over a period of a year. Entering basic knowledge of the system will give you an estimate if it is in the plus range or the system is losing money.





Conclusion

The skylight does have a net earnings annually in regards to energy consumption. Keeping the skylight is beneficial to the lobby space in both cost savings within electric lighting, cooling, and heating.Savings in annual energy is close to 75000 kWh/yr which exceeds assumptions.

Conclusion

The Rio Hondo Library and Learning Resource Center is a building that will be enjoyed by the students because it does not feel like a library. The spaces that were chosen for the redesign were intricate spaces with angled ceilings, glass facades, a curve around the south curtain wall that follows the pattern of the earth. Overall the spaces were unique to each other so each space offered a new challenge.

In the redesign of the stack area and the Microfilm and Reading Area, a new controlled daylight system was added which will aid in future energy conservation. Taking into consideration the stringent laws of California and their energy codes, the design was developed. Each space had a different hierarchy and was taken into consideration. Overall the building was a challenge because working with a library brings on a different set of standards.

On the electrical side, in an attempt to combine transformers to save money, more money was actually spent. Discovering that sometimes bigger is not always better is a lesson learned from the electrical analysis.

For the mechanical breadth work, the skylight was analyzed and the total annual energy savings was configured for the system.

After a year of work, learning how systems integrate together is an invaluable lesson.